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DEVELOPMENT OF A DISTRIBUTED, ADAPTIVE, DIRECTION AND CONTROL (--ETC(U)).
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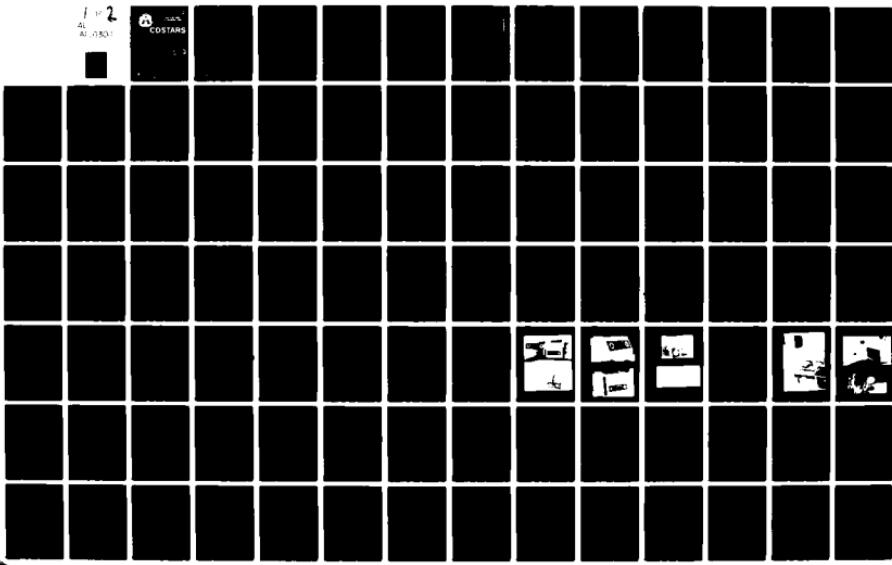
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RHODE ISLAND DEFENSE
CIVIL PREPAREDNESS AGENCY

CDSTARS

(CDSTARS is an acronym created to refer to a Civil Defense State Radio System)

AD A100304

DEVELOPMENT OF A DISTRIBUTED, ADAPTIVE, DIRECTION AND CONTROL
(Civil Preparedness Communications) NETWORK WITHIN THE STATE OF RHODE
ISLAND, WHICH MAY SERVE AS A PROTOTYPE MODEL FOR THE DESIGN OF
STATE AREA NETWORKS IN OTHER STATES.

By

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Washington, D.C. 20472

Prepared Under Contract Number DCPA01-78-C-0314

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| Radio Amateur Communications Emergency Service RACES Civil Defense Amateur Radio Service Radio Communications Telecommunications Civil Defense State Radio System CDSTARS Civil Defense National Radio System CDNARS Electro Magenetic Pulse EMP Facsimile record copy | | | | | | |

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FINAL REPORT

Development of a distributed, adaptive Direction
and Control (Civil Preparedness) Radio Network
within the State of Rhode Island which may serve as a
prototype model for the design of State Area
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by

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March 1981.

ABSTRACT

This report contains the results of the development of a distributed, adaptive Direction and Control (Civil Preparedness) Radio Network within the State of R.I. which may serve as a prototype model for the design of State Area Networks in other States. The project was divided into four parts:

1. Produce a Requirements Study and Alternatives Evaluation.
2. Procure and install a cost effective prototype model radio network.
3. Procure and install a record copy (Facsimile) capability at each station in the Radio Network.
4. Test and evaluate the aforementioned system under day to day, Natural disaster and simulated Nuclear disaster conditions. The R.I. Defense Civil Preparedness Agency called this system CDSTARS, Civil Defense State Radio System, and accomplished this research and development work between Sept. 22, 1978 and March 31, 1981.

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UNCLASSIFIED TITLE

DEVELOPMENT OF A DISTRIBUTED, ADAPTIVE, DIRECTION AND CONTROL SYSTEM FOR THE STATE OF RHODE ISLAND, WHICH MAY SERVE AS A PROTOTYPE MODEL FOR THE DES

ABSTRACT

(U) THIS REPORT DESCRIBES THE PROBLEMS AND A SERIES OF SOLUTIONS TO THE DEVELOPMENT OF A DISTRIBUTED, ADAPTIVE, DIRECTION AND CONTROL SYSTEM FOR THE STATE OF RHODE ISLAND. THE SYSTEM WAS COMPOSED OF COST EFFECTIVE TWO WAY RADIO VOICE EQUIPMENT. ITS, THE SYSTEM WAS COMPOSED OF COST EFFECTIVE TWO WAY RADIOS (VOICE EQUIPMENT). TO PERMIT OPERATION UNDER 'BLACKOUT CONDITIONS', A UNIQUE BATTERY WAS PROVIDED TO POWER THE RADIOS. THE BATTERIES WERE TAKEN UP TO TWO WEEKS UNDER SUCH CONDITIONS. SIMPLE EMP MEASURES WERE TAKEN TO PREVENT THE RADIOS FROM BEING EITHER TURNED OFF OR THE BATTERIES DISCHARGED. THE BATTERIES WERE PROVIDED BY THE R.I. NATIONAL GUARD WHO HELPED IN LICENSING THE SYSTEM AS A JOINT PROJECT. THE CIVIL DEFENSE AUTHORITY MADE SIMPLE THE TASK OF IDENTIFYING STATIONS ON THE NETWORK. EACH STATION ULTIMATELY HAD TO BE APPROVED BY THE HEAD OF LOCAL GOVERNMENT. THE CIVIL DEFENSE AUTHORITY WAS PLACED WHERE TRU DIRECTION AND CONTROL ACTIVITIES TAKE PLACE.

INDEX TERMS ASSIGNED

BLACKOUT CONDITIONS
USE BLACKOUT(PROPAGATION)

CIVIL PREP
USE CIVIL
COMM

CONTROL POINTS
USE CONTROL CENTERS

DISTRIBUTED
USE ADA
DIR
DIS

EMERGENCY RESPONSE UNITS
USE EMERGENCIES
RESPONSE

HEAD
USE HEAD

LOCAL GOVERNMENT
USE UNITED STATES GOVERNMENT

NATIONAL
USE NAT

POSITIVE VOICE IDENTIFICATION
USE SPEECH RECOGNITION

PROTOTYPE
USE MOD
PRO

RADIOS
USE RADIO EQUIPMENT

SIMPLE EN
USE ELE

SPECIAL MODIFICATIONS
USE MODIFICATION

STATE AREA
USE NET

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JUN 24, 1981

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DIRECTION AND CONTROL (CIVIL PREPAREDNESS COMMUNICATIONS) NETWORK WITHIN THE STATE IS A PROTOTYPE MODEL FOR THE DESIGN OF STATE AREA NETWORKS IN OTHER STATES.

S AND A SERIES OF SOLUTIONS TO THE IMPLEMENTATION OF A STATEWIDE CIVIL PREPAREDNESS SYSTEM. TOGETHER LOGICAL CONTROL POINTS OF LOCAL GOVERNMENTS AND EMERGENCY RESPONSE UNITS USED TWO WAY RADIO VOICE EQUIPMENT WITH FACSIMILE RECORD COPY CAPABILITY (UNATTACHED CONDITIONS). A UNIQUE BATTERY POWER MODULE WAS DEVELOPED TO POWER THE UNIT. SIMPLE EMP MEASURES WERE TAKEN AT EACH STATION AS WELL AS SPECIAL MODIFICATIONS TO THE UNIT. VOLUME WAS TURNED OFF OR THE VOLUME FROM BEING SET TOO LOW. THE PROJECT WAS COORDINATED WITH LOCAL GOVERNMENT IN LICENSING THE SYSTEM AS A JOINT PUBLIC SERVICE EFFECT. POSITIVE VOICE IDENTIFYING STATIONS ON THE NETWORK. STATION LOCATION SITE SELECTION WAS A CHALLENGE APPROVED BY THE HEAD OF LOCAL GOVERNMENT, LOCAL CD DIRECTOR & STATE DIRECTOR. THE DIRECTION AND CONTROL ACTIVITIES TAKE PLACE BASED UPON ACTUAL EXPERIENCE.

INDEX TERMS ASSIGNED

CIVIL PREPAREDNESS COMMUNICATIONS
USE CIVIL DEFENSE
COMMUNICATION AND RADIO SYSTEMS

DISTRIBUTED ADAPTIVE DIRECTION
USE ADAPTIVE SYSTEMS
DIRECTION FINDING
DISTRIBUTION

HEAD
USE HEAD(ANATOMY)

NATIONAL GUARD
USE NATIONAL GUARD

PROTOTYPE MODEL
USE MODELS
PROTOTYPES

SIMPLE EMP MEASURES
USE ELECTROMAGNETIC PULSES

STATE AREA NETWORKS
USE NETWORKS

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STATION LOCATION SITE SELECTION
USE POSITION(LOCATION)
SITE SELECTION
STATIONS

TERMS NOT FOUND DURING LEXICAL DICTIONARY

BATTERY POWER MODULE
JOINT PUBLIC SERVICE EFFECT
STATE DIRECTOR

CONTROL AC
LOCAL CD D
STATEWIDE

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PAGE 8

JUN 24, 1981

NOT FOUND DURING LEXICAL DICTIONARY MATCH PROCESS

CONTROL ACTIVITIES
LOCAL CD DIRECTOR
STATEWIDE CIVIL PREPAREDNESS TELECOMMUNICATIONS SYSTEM

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EXECUTIVE SUMMARY

This report contains the results of two years of planning, installing, establishing of procedures, as well as the testing and evaluating of a model Civil Preparedness Statewide Radio Communications System (here and after referred to as "CDSTARS", Civil Defense State Radio System). The CDSTARS, though not meant to replace telephone - the primary communications system-works as simply and effectively as telephone - without fragile and vulnerable overhead wires, over which Civil Preparedness Agencies have no control.

This report covers the work necessary to establish such radio communications; the problems inherent in "legally" establishing such a network; the technical requirements, not only at the State Control point of such a system, but also at each and every component of the system. On site inspections of potential communications points were necessary and determinations had to be made as to the acceptability of these places from a Civil Preparedness point of view and for technical reasons as well. The results of some of these field visits are included as part of this report as well as a summary.

As the State felt ownership of the system should remain with State Government to assure dependable operation of the system, a loan arrangement with each community had to be agreed upon. This loan agreement helped to lay the basis for:

- (1) The legality of network
- (2) Establish ownership and responsibility for the CDSTARS Stations
- (3) Establish precisely where each CDSTARS Station would be located - Copies of sample loan agreements are included in this report.

The State had to deal with over twenty different vendors, and the State installed each CDSTARS Station using its own personnel. Personnel from other State Agencies and Student Intern Programs were drawn upon to accomplish the program.

The requirement for a dependable non-wire communications system between state and local government is as important as the requirement for a non-wire capability between the state and federal government; i.e. The Civil Defense National Radio System (CDNARS). Using essentially the same rationale and a similar acronym, the Civil Defense State Radio System (CDSTARS) was conceived as a pilot prototype project to provide a demonstrable working system around which to resolve the numerous problems facing such a Radio Communications Program.

There were many obstacles to such a system; many of which still remain today. Each of these problems is treated separately in the report, so as to provide a guide for others to follow in planning future systems of this type. As with any new program, the primary problem was, and still remains, with funding. Unless such programs are fully federally funded, the future of additional CDSTARS Networks is indeed bleak.

Another very difficult problem is in arranging for the licensing of such a system, for strange as it may seem, existing FCC rules tend to prohibit the type of system about to be described, though it is simply a replica of the existing federal system, CDNARS. To accomplish the CDSTARS demonstration project, the program was licensed under military auspices, as is the CDNARS. Details of the difficult procedures to accomplish same are described herein.

As with CDNARS, it was decided the State would have to assume maintenance of CDSTARS, similar to federal maintenance of CDNARS. As such, CDSTARS equipment was loaned to the participating stations under a loan agreement that required the signature of the local CD Director, the head of local government, and the State Civil Defense Director. A place which met with the approval with all parties who signed the loan agreement was selected for the actual location of each station. Usually, but not always, the site was at the so-called "Emergency Operating Center" (EOC). In some cases, the EOC was an inappropriate place for the unit. Details of the selection process are innumerated in this report.

While telephone is the primary means of communication for Civil Defense Direction and Control activities, it is well known to Civil Preparedness officials that during some emergency situations, telephone services have failed. Direction and Control activities without adequate and reliable communications

is virtually impossible. While each individual city or town might have many means of communications available; i.e.: telephone; police, fire, and public works radio, rarely do any of these capabilities except telephone, tie into a common network for mutual aid and intra-governmental facilities. This void is somewhat universal, for many communities actually seek out methods to sequest themselves from adjacent communities through a process known as "frequency coordination". This process, required by the FCC, places communities adjacent to one another on radio frequencies which are different, so as to avoid interference. This process also places these same communities in a vacuum when telephone communications fails.

Some effort has been made to correct this problem between state and local government police and fire elements with the advent of the so called "inter-city police and inter-city fire radio networks". These networks are reserved for police and fire activities and rightly so. During major disasters, these channels are generally jammed with police and fire communications.

What is lacking, therefore, is an inter-city Civil Defense Radio Network and the demonstration prototype described herein is just that.

The contract work described herein was performed during the period when the Defense Civil Preparedness Agency (DCPA) was being merged into the new Federal Emergency Management Agency (FEMA). The new expanded role that FEMA was to perform was taken into consideration in the development of this radio system. The State of Rhode Island drew upon a rather successful Radio Amateur Civil Emergency Service (RACES) program, for a great deal of the technical requirements and operating practices that were used in the demonstration system. The reason that RACES was discarded as the means to provide the radio system was the recent FCC requirement that all RACES operators be amateur licensees.* This was impossible to achieve at 66 stations and created undue recruiting problems for local communities and supporting emergency response agencies.

While the primary function of the demonstration system was for Direction and Control Operations; increased readiness, mutual aid, radiological defense, crisis relocation (evacuation coordination), damage assessment, and warning are all possible on the system.

* Operation of a RACES station by a non-amateur is permitted IF a licensed AMATEUR is PRESENT to control the station.

An effort was also made to increase the survivability of the CDSTARS through the use of established electro-magnetic pulse (EMP) theory and practice. To enhance the system's durability and eliminate reliance upon commercial power, battery operation was selected to permit the system to function during power outages.

Cabinets were clearly marked "Civil Defense State Radio System" for visibility and were fitted with special screws to prevent the curious from tampering with the units.

The main objective of the entire project was to develop a cost effective radio communications package which was simple to operate, dependable, and would operate independently of any outside power source for a period of up to 2 weeks. To outfit 60 stations and meet the above criteria, the average cost of each station had to be less than \$1800, (including record copy capability which would not interfere with the 2-way voice system). Those who are familiar with 2-way radio projects of this magnitude will immediately realize that \$1800 barely purchases an ordinary base station, never mind the duplex capabilities suggested, and facsimile record copy sought. Through competitive bidding, and careful purchasing procedures, with assembly and installation by state personnel, the requirements were met within the costs outlined.

Another objective of the planners involved in the project was to maintain strict discipline on the networks once the system was made operational. The details as to how this was accomplished are contained in this report.

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CHAPTER ONE

INTRODUCTION

1.1 DESCRIPTION OF WORK

This report describes the work performed by the Rhode Island Defense Civil Preparedness Agency, Telecommunications Unit, to conduct a study to document the emergency direction and control requirements, identify the capabilities of the existing system, study alternative solutions to resolve identified deficiencies, develop, procure, and install, the most cost effective alternative solution, then test and evaluate that direction and control communications system under simulated and real disaster environments under contract DCPA01-78-C-0314.

Another aspect of the work study was to suggest survivable direction and control system alternatives which could not be totally targeted. The State of Rhode Island was to serve as a model "Cell" of somewhat larger multi-cellular systems for larger states. The project demonstrates how complete 2 way and record copy communications by radio is practical for state to local, state to support agencies, as well as individual community to community communications for mutual aid as well as alternative locations for the state to operate from. Operations from other than state locations are practical. The project was produced in four phases:

- Phase One consisted of the requirements study and alternative solutions.
- Phases Two and Three consisted of procurement and installation of the demonstration two way voice radio network with one way record copy capability.
- Phase Four was the test and evaluation of the system.

1.2 REASON FOR STUDY AND ALTERNATIVES EVALUATION

A Civil Defense State Radio System such as developed in the State of Rhode Island offers many advantages to other states. Several advantages are:

- Improved warning supplemental information

- Improved probability of mutual aid taking place between adjacent communities
- Improved dissemination of information post-disaster
- Independence from existing fixed terrestrial communications system, such as telephone lines
- Independence from pre-emption on radio systems, such as inter-city police and inter-city fire
- Minimal probability of interference due to statewide coordination by one source
- State supervision of direction and control and state maintenance of the system
- System designed to be available for inter-governmental emergency
- Uniformity of equipment at each station to simplify exchanges in the event of breakdown
- Quantity purchasing of like items afforded excellent cost effectiveness

Special consideration was given to developing a system which would work during blackouts, natural and other disaster situations.

Every effort was made to keep the operation of the system as simple as possible.

1.3 STUDY OBJECTIVES

The general objective of this project is to examine the feasibility of satisfying some or all of a State's Communications Requirements through a demonstration Civil Defense State Radio Communications System. The specific objectives are to:

- Establish the communications requirements of a Civil Defense State Radio System (CDSTARS)
- Determine the specific locations of the components of such a system
- Assess the probability of radio communications between

- the individual stations on the network and its control point
- Identify the type of equipment which best meets the operational needs of a Civil Defense Radio System at the lowest cost

1.4 STUDY ASSUMPTIONS

- That competent state workers be available to procure, install, and maintain such a system
- That a vehicle be available to transport the materials necessary to construct and maintain such a system
- That a working arrangement be available for the use of at least two radio frequencies
- That paths be probable between the stations involved, in that no repeaters would be used
- That each station on the network be able, as a minimum, to hear its immediate neighbors, as well as the state control station
- That all stations have floating battery power modules, similar to emergency lighting systems, to provide absolute power failure protection

1.5 ORGANIZATION OF REPORT

The balance of this report is divided into six chapters. Chapter Two describes the overall study approach taken by the Rhode Island Defense Civil Preparedness Agency to accomplish the project. Also included in that chapter are the information sources used in the study, major source documents, results of field studies, listings of equipment evaluated, a listing of vendors contacted, results of path study, and the selection of actual location of individual stations. Chapter Three describes the communications requirements, both operational and technical. Chapter Four provides a description of the demonstration Civil Defense State Radio System, including the process for selecting the actual location of each CDSTARS local control point. Chapter Five is a Civil Defense State Radio System overview describing minor problems, lessons learned, and evaluation of equipment used. Chapter Six provides conclusions and recommendations for future, similar Civil Defense State Radio Systems.

CHAPTER TWO

STUDY APPROACH

2.1 OVERALL APPROACH

The overall approach to establishing the Civil Defense State Radio System Demonstration Project was to first produce an Emergency Communications Planning Report, (ECPR), which was subsequently followed by an Emergency Communications Development Plan, (ECDP), based upon Civil Preparedness Guide (CPG 1-18). The Rhode Island ECDP which was approved by Region One, Oct. 18, 1978, recognized the deficiencies identified in the subject document. A narrative of the systems in place and the deficiencies noted and proposed actions to correct same is reproduced from subject document:

NARRATIVE OF ACTIONS TO CORRECT DEFICIENCIES

To provide a reliable communications posture with Central Control, the State of Rhode Island has established an Emergency Operating Center (EOC) in the basement level of the Rhode Island State Capitol Building. The EOC is served by an emergency power plant which is tested regularly, has a fourteen day fuel supply, contains modest radio communications, in the event telephone and other common carrier services fail.

The main systems in the EOC are: State Police (two channels), accessed through micro-wave; Department of Transportation, one channel accessed through micro-wave, backed up by a 250 Watt base station in the EOC. Department of Environmental Management, a modest console operational on two of the three channels in use by that department. National Guard, a single sideband transceiver capable of operation on several SSB frequencies in use by the Guard, and a FM transceiver which nets with National Guard vehicles (38.7 MHz). The Radio Amateur Civil Emergency Service (RACES) communications that now exists is composed of antiquated AM equipment which has never functioned satisfactorily. Recent Federal Communication Commission rules requiring only Amateur Operators in RACES have further destroyed this program particularly where amateurs are few. Present thinking is to disband the current system in favor of a new Civil Defense Radio Service using professional equipment (FM fixed channel units) operated by municipal personnel backed up by amateur radio volunteers as available. Amateur radio RACES will continue to be encouraged at local levels, however. The Civil

Defense National Radio System (CDNARS) base station in the EOC operates on frequencies that have proved unreliable between Region One and the State of Rhode Island's EOC. The RPU between WEAN CPCS-1 and this facility must be retrofitted to comply with narrow band FCC regulations relating to such units. Because this State is scheduled to be included in an Electro-Magnetic Pulse (EMP) hardening (shielded room kit), a complete revamping of the Communications Center is about to take place.* Based upon availability of space, new and larger quarters are being sought within the sub-basement for the expanded role now being carried out by the Communications Unit.

To assess the posture of the State's Emergency Communications capabilities each service will be headlined and an assessment of the existing capabilities, and any problems with such capabilities explained, as well as suggested actions to correct the deficiencies.

STATE POLICE: Base stations which provide Transmit and Receive functions for State Police are located at unmanned sites in the small Towns of Exeter and Scituate. Control, and therefore, use of these base stations, is via micro-wave only. The console assigned to the State Defense Civil Preparedness Agency's (DCPA) EOC is capable of using only two of the eight channels in use by Rhode Island State Police. Such limited access to the system is a deficiency which must be resolved. In the event the micro-wave fails, there is no method of transceiving on State Police channels from the EOC, therefore, a back-up base station capable of operation on all State Police channels is required in the EOC. To reduce costs, this unit should probably be a multi-frequency base. A dedicated Civil Defense radio between the State Police headquarters would assist in coordination between agencies in emergencies.

DEPARTMENT OF TRANSPORTATION: The existing base station, though twenty years old, backs up the remote operation of the main base station, located in Scituate. That control, exercised through a channel in the a-fore-mentioned State Police micro-wave system can be accomplished from the State EOC as well as from other points, as shown in the inventory. No action required at this time, other than routine maintenance.

* EMP Program accomplished

DEPARTMENT OF
ENVIRONMENTAL
MANAGEMENT:

The existing base station operating on two of the three Department of Environmental Management frequencies obviously needs third channel capability. The unit in place is not capable of being retrofitted without great expense, and due to the age of the unit (twenty years) this would not be cost effective.

NATIONAL GUARD:

The existing single band equipment is acceptable for its intended purpose. The lack of National Guard FM direct communications on its operational frequencies is being met by the National Guard.

PUBLIC UTILITIES:

As each public utility, (the Electric Companies, the Gas Companies and the Telephone Company) has its own operational channel, placing fixed equipment for each company in the EOC would be prohibitive, from an interference viewpoint, as well as space considerations. To allow non-telephone communications with these important utilities, particularly during and following disasters for damage assessment and restoration, communications has been on the Radio Amateur Civil Emergency Service (RACES). RACES has proved only fair, based upon experience. The new FCC requirements for licensed radio amateurs ONLY, as operators, have further diminished this program's usefulness. It is planned therefore, to initiate a new Civil Defense Radio Service to fulfill the above requirements and to use duty personnel as operators (those whom presently operate the communications already being used by the utility).

HEALTH DEPARTMENT: Communications between the Rhode Island Department of Health and the State DCPA are currently on the RACES and the above statements apply. As a new system is integrated, the Health Department will be included.

NATIONAL
WEATHER SERVICE:

Our present communications with the National Weather Service is limited to landline connection, of which there are three methods; common telephone, teletype and NAWAS, but in the event of land-line failure, it is certain all three methods would fail. A direct radio connection between the State's EOC and the

National Weather Service is necessary and is being programmed, per above.

RED CROSS:

Our present Red Cross communications exists via the RACES and again, the utilities comments apply. To reduce the size of the State network, we have asked that a single chapter be designated to coordinate the communications between the two agencies. At present, the State EOC is able to communicate directly with Newport, Central Rhode Island (Warwick), Providence and Woonsocket Chapters of RED CROSS. In the future redesign, messages for other chapters would be directed to Providence, who in turn would pass the traffic to the appropriate chapter and vice-versa. The Red Cross is also planning to position a Red Cross dedicated channel radio in the EOC at its expense to provide absolute communications between the Providence Chapter and the State's Defense Civil Preparedness Agency's EOC.

SALVATION ARMY:

Only telephone communications exists between these two agencies at this time. The possibility of a State installed radio to establish a liaison between the two agencies is being contemplated.

CIVIL AIR PATROL:

RACES radio communications exists between the CAP wing headquarters and the CAP office at the North Central Airport. The CAP does not carry a full compliment of amateur radio operators once again, our current system is endangered by the new FCC rules. It is planned, therefore, to establish a NON-RACES capability with CAP, at least at the Wing Headquarters, with perhaps an additional station at North Central Airport. In the meantime, CAP is programming a CAP radio and operator for the State EOC. Which-ever solution materializes will solve the deficiency forecast.

BROADCAST MEDIA:

The State's CPCS-1 station in WEAN. The in-place Remote Pick-up Unit (RPU) is a two way radio UNTIL such time as it is placed in service. This has not proved to be a good method of communicating with the CPCS-1, but has proven itself as a back-up means for providing programming for the Emergency Broadcast System (EBS), its original intention. We have determined through practice, however,

that additional communications above and beyond the RPU is necessary. It is programmed, therefore, to add the CPCS-1 station to the State Civil Defense Emergency Network. Plans are also in the works for adding a video capability to the Rhode Island EBS. Once final plans for this are completed, the receiving station(s) of this feed will also require absolute radio communications with the State EOC.

SUBDIVISIONS:

State to local communications between the State EOC and the local EOCs, some of which are not hardened, is primarily by telephones. Thirty one of the thirty nine Rhode Island subdivisions are also tied to the State Police teletype system which is primarily a law enforcement circuit. Radio communications to the subdivisions is via RACES and the public utility comments apply here as well. The outdated AM equipment is long overdue for replacement and lacks the professional standards currently available to other emergency services such as police and fire departments. The requirement for licensed amateur radio operators has created new difficulty in recruiting and in manning problems which do not exist in the other emergency response fields. The State of Rhode Island is awaiting FCC action of Docket RM80-7 which calls for the creation of a civil defense radio service, as it relates to the Inter-City networks currently in use by those services. In the meantime, we are investigating solving the dilemma by using National Guard frequencies to accomplish our objectives. Due to the bad experiences as determined from actual disaster action, it has been decided that a RADIO written word capability devoted exclusively to civil defense communications be established in local sub-divisions. It has been learned that mixing civil defense messages in between stolen car reports, missing persons reports, weather forecasts, etc., just does not work and in our case the entire system is at the mercy of the phone company with its vulnerable land lines. To add greater dimension to such a written word system, it is proposed that facsimile be used. Maps depicting radiological hazards and forecasts, crisis relocation information, Governor's

SUB-DIVISIONS:
(Con't.)

State of Emergency (signed on Executive stationery) etc. could all be placed in the hands of local officials quickly and simultaneously using such a system. By limiting the transmissions on the system to inter-governmental business, the system will be turned to in emergencies for guidance and official information. Adding two-way voice radio to the system allows for questions to be answered and for meaningful exchanges of intelligence. The intended system is to be designed simply to allow for chief executives to talk with one another without their requirements for operators, when the occasion arises. This does not preclude the manning of these stations by amateurs for the duration of disasters, but actually adds to the total effectiveness of the system, particularly at the moment the disaster strikes and volunteers are not yet mobilized. There are times when telephones remain operative under surprisingly difficult conditions, witness the large amount of telephone service available to us during the blizzard but thousands of phones went out during the disastrous ice storms just weeks before. When a single transistor failed only two weeks ago, the entire State Capitol Centrex System failed for many hours. Luckily, the State EOC does not rely completely on Centrex for its telephone service. With the vulnerability of telephones and overloading (busy signals, slow dial tones, etc.), a radio capability with sub-divisions is necessary, even in the smallest of emergency situations. The actions outlined above in Rhode Island, and using VHF radio frequencies should permit twenty-four hour absolute communications under the most trying conditions. Adding solid antenna installations, small scale EMP and lightning protection to the system should enhance its dependability even more. Systems such as described, will perform adequately only when tested regularly and perform even better when used daily. The State will be considering ideas for daily use of such a system so as to keep its readiness at the highest state while not diminishing its role as an emergency communications system.

STATE FACILITIES: The State of Rhode Island has facilities

STATE FACILITIES: (Con't) scattered throughout the State which have proved to be of great value for the recovery efforts. The Zambarano Hospital in Burrillville, for example, is a complete facility with its own water and generates its own power, kitchen facilities and 100 PF. A similar situation exists at the State Medical Center in Cranston, this complex also houses inmates in its prison facilities. Other State facilities not served by State Communications Systems are the Ladd School in Exeter, the Bristol Veterans Home in Bristol, and the Gen. Svcs. Prop. Mgt. Center in Mt. Pleasant, plus other State owned facilities, mainly in Providence, Warwick and Kingston. Some of these facilities are now served by the RACES radio system but will require updating along the lines mentionned above under sub-divisions. Which facilities will be added to or remain in the network is a matter for the State Director to decide.

FEDERAL TO STATE: Experience with the Civil Defense National Radio System (CDSTARS) has proved that it's reliability over any given twenty-four hour period leaves something to be desired. It is proposed that a VHF radio link be established between the two points to correct this problem. Such a link will also provide for facsimile between the two EOCs, as well as voice.

2.2 EVALUATION OF RACES

During the "Blizzard of 1978", telephone services at the Defense Civil Preparedness Agency worked, but were over burdened, creating very difficult communications problems. Essentially, busy signals were the number one problem, due to the sheer volume of callers. This forced the Agency to resort to the Radio Amateur Civil Emergency Service (RACES) Radio Communications, only to discover that (RACES) operators were generally not located at the places where direction and control was taking place from or that (RACES) was simply not in operation in the communities with which we had a desire to communicate. This is not a new problem. It is

the paramount problem with RACES ; that is, well meaning amateur operators establishing radio communications from places other than where officials are making decisions from i.e.: their homes, or from long forgotten emergency operating centers (EOCs). It was for these reasons that a procedure for selection of the actual sites had to be conducted by our consultants. The actual locations of Civil Defense State Radio Systems (CDSTARS) Stations is appended as Appendix One. In many cases the actual location of CDSTARS Stations was identical to the former location of RACES Stations, but in many additional cases new locations were sought and developed. The principle criteria for establishment of the CDSTARS Station in a local community was essentially a place where direction and control activities took place from, using the recent "Blizzard of 1978", as the prime example. Where practical, considerations for nuclear protection was also given. Where practical, extensions from unoccupied EOCs were provided to operate the radio. Better than half the installations required such extensions. Consultants working in the field with data summary sheets provided the technical considerations necessary for the installation of these extensions, such as the length of remote control cable, whether to install a new antenna or use the existing antenna, and other technical problems encountered at each individual site. A sample of a typical consultants field data summary sheet is appended as Appendix Two. By summarizing the facts obtained in the individual consultants field data summary sheets. an approximation of the total requirements, and antennas necessary for the system could then be determined. The summary of extension requirements and cable lengths is appended as Appendix Three.

2.3 LISTING EQUIPMENT EVALUATED

A considerable number of different types of electronic equipment were evaluated by the Rhode Island Defense Civil Preparedness Agency during the course of this contract. The following list we have provided are the categories

of equipment evaluated were:

- Two Way Radio Transceivers
- Extended Local Control Units
- Batteries and Charging Schemes
- Antennas and Duplexers
- Facsimile Receivers and Facsimile Printers
- Amateur Fast Scan TV Transmitter/Converters
- D.C. Remote Control Units
- Battery Cases
- Metal Cabinets

2.3.1 TWO WAY RADIOS (TRANSCEIVERS)

The principle vendors for two way radio products evaluated were:

- Standard Communications Corporation
P.O. Box 92151
Los Angeles, California 90009
Standard Communications Model 890L-1
- Aerotron , Incorporated
P.O. Box 27500
Raleigh, North Carolina 27611
Aerocom Six
- RCA Mobile Communications Systems
Meadowlands, Pennsylvania 15347
Model # TAC300
- General Electric Company
Mobile Radio Department
Lynchburg, Virginia 24502
GE Mobile Radio Model MVP

- General Aviation Electronics, Incorporated
4141 Kingman Drive
Indianapolis, Indiana 46226
Genave # GMT225
- Motorola Communications and Electronics, Incorporated
1301 East Algonquin Road
Schaumburg, Illinois 60196
Motorola # MOXY/43GMB
- Regency Electronics, Incorporated
7707 Records Street
Indianapolis, Indiana 46226
Regency Model RECAP-2 (Regency notified our Agency subsequently that the RECAP-2 had been discontinued)

2.3.2 EXTENDED LOCAL CONTROL UNITS

The extended local control units were required to provide duplicate operational capability on premises. Models evaluated for this function were:

- Communications Products, Incorporated
1401B South Floyd Road
Richardson, Texas
Communications Products Model 705-SP
- IDA Corporations
P.O. Box 2731
Fargo, North Dakota 58102
IDA Model 20-11
- Solid State Communications, Incorporated
21060 Corsair Boulevard
Hayward, California 94545
SSC Model 803-5
- SYT Corporation
2208 Texas Avenue
P.O. Box 9157
El Paso, Texas 79901
SYT Radio Extension Set Model 12-610

2.3.3 BATTERY DATA

Lead calcium alloy maintenance free batteries were selected for the CDSTARS power modules. Maintenance free batteries

gas less so that corrosion build up around battery terminals is substantially reduced. Three of the batteries evaluated were:

- East Penn Manufacturing Company, Incorporated
Lyons Station, Pennsylvania 19536
DEKA Model # 924MF
- Titan Battery
Locally distributed by the Battery Shop
Fresno Street
Warwick, RI
Model # Titon 24-4MF
- The J.C. Penny Company
199 Connell Highway
Newport, RI 02840
J.C. Penny Lot # 2201

2.3.4 CHARGING POWER SUPPLIES

In order to keep the aforementioned batteries charged and ready for use, several charging schemes were tried. Among the power supplies evaluated for charging were:

- Automatic Radio
2 Main Street
Melrose, Mass. 02176
Filtered Regulated 12 Volt Supply Model # HPS-2000
- ETCO Electronics
North Country Shopping Center
Route 9North
Plattsburgh, New York 12901
Power Supply Model PS1202U

2.3.5 ANTENNAS

Various types of antennas were required at the individual stations in the network to accomplish the paths necessary. Among the antennas evaluated and used were:

- Cushcraft Corp.
P.O. Box 4680
48 Perimeter Road
Manchester, New Hampshire 03108

Model numbers used were:

RINGO RANGER ARX-2
Four Pole AFM-4D
Four Element Yagi Beams Model A147-4
Eleven Element Yagi Beams A147-11
Twenty-two Element Power Pack Beam A147-22

- Nu - Tronics Corporation
15800 Commerce Park Drive
Brook Park, Ohio 44142
Hustler Model G6-144B Base Station Antenna
- Larsen Electronics Incorporated
P.O. Box 1686
Vancouver, Washington 98668
Larsen Model FB1-136
Larsen Yagi Model YA-1-406
- The Antenna Specialists Company
12435 Euclid Avenue
Cleveland, Ohio 44106
UHF Model ASP604 Series 10DB Gain Broad Band Corner
Reflector and Model ASP-760 Series Broad Band Yagi Antenna
10DB Gain
- Phelps Dodge Communications Company
Route 79
Marlboro, New Jersey 07746
Super Stationmaster Base Station Antennas Catalog #220

2.3.6 DUPLEXERS

To permit duplex operation of the facsimile receiver/printer and the two way radio, duplexers were required at each station. This Agency evaluated three duplexers to accomplish the task. They were:

- Sinclair Radio Laboratories
675 Enswinger Road
Tonawanda, New York 14150
Sinclair Model # MR-256 Mobile Duplexer

- TXRX Systems Incorporated
P.O. Box 105
8625 Industrial Parkway
Angola, New York 14006
Notch Duplexer Model # 27-36-03
- Phelps Dodge Communications Company
Route 79
Marlboro, New Jersey 07746
Mobile Duplexer Catalog #636A

2.3.7 FACSIMILE RECEIVERS

- Electra Company
300 East County Line Road
Cumberland, Indiana 46229
Barecat Alert Receiver Model BC-W
- WeatherAlert
Distributed locally by Lectronic Supply
East School Street
Woonsocket, RI 02895
WeatherAlert Model TA-3
- Gorman-Redlich Manufacturing Company
6 Curtis Street
Athens, Ohio 45701
Single Frequency Receiver Model CRW
- Regency Electronics Incorporated
7707 Records Street
Indianapolis, Indiana 46226
Single Frequency VHF Receiver
- Standard Communications Corporation
P.O. Box 92151
Los Angeles, California 90009
Single Frequency VHF Monitor Model #850Z
- Electrosonics International Incorporated
Instalert Division
41 Polk Street
P.O. Box 128
Riverside, New Jersey 08075
Single Frequency VHF Receiver Model #EMD-SP

2.3.8 FACSIMILE PRINTERS

Due to the nature of Civil Defense Operations it was decided that unattended facsimile printers only would be evaluated for this project. Among the printers evaluated were:

- Alden Electronic and Impulse Recording Company Incorp.
West Borogh, Mass. 01581
Alden Model #800
- Graphic Sciences Incorporated
Corporate Drive
Commerce Park
Danbury, Conn. 06810
DEX Model 4300
DEX 3000
DEX 3400
All receive only Facsimile machines.
- Infolink Corporation
125 Irving Street
Framingham, Mass. 01701
Scanatron Model DAR(2)
- Murihead Incorporated
1101 Bristol Road
Mountainside, New Jersey 07092
Murihead Mercury IV Mobile Facsimile Recorder
- Xerox Corporation
One Weybosset Hill
Providence, RI 02903
Xerox Telecopier III
- 3M Business Products Sales Incorporated
965 Waterman Avenue
East Providence, RI 02914
MagnaFax Model #856
- Stewart Warner Datafax Corporation
1300 North Kostner Avenue
Chicago, Illinois 60651
Stewart Warner Datafax Facsimile Transceiver Model #240,
Model #180

2.3.9 AMATEUR FAST SCAN TELEVISION TRANSMITTER AND FOUR MATCHING RECEIVERS FOR EMERGENCY BROADCAST SYSTEM (EBS) TELEVISION AND AUDIO CAPABILITY

In order to provide a video link between the four serving television channels in RI and the RI Emergency Operating Center, special FCC permission was obtained to conduct these experimental video trials.* The vendors contacted and the equipment evaluated were:

- PC Electronics
2522 Paxson Lane
Arcadia, California 91006
Model #TXA5-2 ATV Exciter, PA5 10 Watt ATV Power Module,
TVC-1 ATV Receiving Converter and FMA5 Audio Subcarrier Generator
- Aptron Laboratories
P.O. Box 323
Bloomington, Indiana 47401
Aptron Laboratories Model AX10B and Aptron Laboratories UHF Receiving Converter Model XR70

2.3.10 D.C. REMOTE CONTROL UNITS

In order to operate the CDSTARS transmitters from various sections from within the Emergency Operating Center, D.C. Remote Control Units were required. The vendors products evaluated for this mission were as follows:

- Communications Products Incorporated
1401B South Floyd Road
Richardson, Texas 75081
Model #740
- IDA Corporation
2615 North University Drive
P.O. Box 2731
Fargo, North Dakota 58102
D.C. Remote Model 20-10 with options 225

2.3.11 BATTERY CASES

It was necessary to place the batteries in a battery case, which also provided a convenient place to mount the charging/power supply. These were acquired from:

* See page A-14-17

- Salks Department Store
2524 West Shore Road
Warwick, RI 02886
"Plastic Marine/type Battery Cases with Straps"

2.3.12 METAL SLOPING FRONT CABINETS

To accomodate the various pieces of equipment in the Civil Defense State Radio System, a tamper proof, sloping front metal cabinet was required. It was decided to require competitive bidding among various suppliers to provide a Bud, model #C1893HG (HG-meaning hammertone gray). The successful vendor was:

- Newark Electronics
2500 Post Road
Warwick, RI 02886

2.4 EVALUATION CONCLUSIONS

The Rhode Island Civil Defense Preparedness Agency conducted evaluations of the aforementioned purchased and loaned samples during subject contract. In some cases merely the technical brochures submitted by the companies were evaluated and in other cases the actual equipment was tested for compatibility for the proposed system. The initial evaluation scheme included:

- The Bearcat Weatheralert Facsimile Receiver
- The Phelps Dodge Duplexer
- The Genave and Standard Transceivers

These were all tested under laboratory conditions representing an actual installation. The Genave, a model GMT225, and the Standard, model 890L, were each tried under identical conditions through a Phelps Dodge, model 636A Duplexer, tuned to the two frequencies to be used in the system, which were separated by 4.05 MHz. The results of these tests using professional Motorola Two way radio test equipment, indicated that the Standard Transceiver produced the least desensing of the Bearcat Facsimile Receiver. The actual measurement was 12 decibels. While this was not acceptable, it was vastly superior to the

Genave Transceiver, which when substituted for the Standard Transceiver in the same configuration produced over 22 decibels of desensing. Both transmitters were tested to produce an output power of 20 Watts, with 15.5 Watts remaining once passed through the duplexer. While these tests clearly prove the Standard Transceiver to be more compatible to the proposed Civil Defense State Radio System (CDSTARS) the desensing of the facsimile channel of 12 decibels could not be tolerated for the type of absolute performance ultimately desired. Therefore, two solutions were put forth to resolve the problem:

- Use wider spacing to separate the two duplex channels.
- Find a better facsimile receiver, one which tends to have a more selective front-end than the Bearcat.

The sensitivity of the test receiver, by the way, was adequate testing at .5 microvolts for 20 decibels of quieting. Once the spacing of the two channels was increased to 6.625 MHz, the criticality of the selectivity of the facsimile channel receiver was lessened. A duplexer, which was under construction by the Sinclair Company was halted and redesigned to accomodate the new wider spacing. The new wider spacing produced the desired results, that is no discernible desensing of the facsimile receiver. The new facsimile receivers tried in place of the Bearcat were:

- An Instalert Model EMD-SP
- A Standard model 850Z

After testing various techniques and discussing various power schemes, it was decided to power the RI Civil Defense State Radio System by a battery. This was to provide those many places that did not have emergency power with a system that worked with or without commercial power. Our field trips revealed many emergency power systems that performed inadequately. In order to be cost effective it was decided to target the cost of such a system at about half that of a similar commercial power supply. In that a typical 5 amp, 12 Volt DC 120 Volt AC power supply sells for about \$100, \$50 per CDSTARS power module was targeted. New low maintenance lead calcium automotive storage cells appeared to lend themselves to this application. Such batteries do not boil away while being charged, as do the older lead acid types, and thus require less attention and little or no replacement electrolyte. None-the-less, if overcharged electrolyte will be lost and must be replenished. The challenge therefore, is to provide a

charging system which did not over-charge the battery. Various schemes to prevent over charging were tried:

- A relay system which selected high/low rates of charge.
- A silicone controlled rectifier (SCR) system, which was based upon the GE SCR Handbook.
- A factory built 13.5 Volt DC regulated power supply.

Eventually the factory built regulated power supply was chosen , after considerable testing with the lead calcium battery purchased for evaluation. Previous systems lead to heating and boiling of the battery, but the regulated supply which actually produced 13.59 Volts DC simply shut down when the battery reached the fully charged state. Actually, a few milliamperes of current tend to trickle into the battery maintaining its state of charge. The exact voltage produced by the supply is internally adjustable. The system was designed so that the transceiver and the facsimile receiver would always be on, so this load (about 400 milliamperes) must always be borne by the supply as well as the battery, continuously. Rated at 2.5 amperes the selected supply adequately handles the load. The battery selected for the project was the largest of its type, which fits into the marine battery cases acquired to protect the battery, hold the power supply and fuses, and be located apart from the RF-CDSTARS module. At most stations, this package was to be beneath the operating table, on the floor, or some other out of the way place, joined by a pair of number 14 wires. These packages were prominently marked; "CDSTARS Power Module". See Appendix Four. The State of Rhode Island is a large purchaser of automotive-type batteries, due to its auto and truck fleets and annually seeks bids for batteries. The holder of the State contract East Penn. Manufacturing suggested that the batteries required for our system might be procured under the Blanket State Contract. Our purchasing division confirmed this and a considerable savings was gained by consolidating our purchase requirements with the States entire order. It was suggested by the manufacturer that we purchase the fleet type lead calcium group 24 batteries with filler caps, Model #924MF, to expedite field maintenance in the future, should it ever be required. The battery cases, the power supply chargers, and the batteries were assembled and labeled by State employees and fully charged prior to delivery to each CDSTAR Station. A .5 ohm isolation resistor was used between the power supply and the battery to act as a current limiter and to help prevent the power supply from being called upon during

transmit functions. Also, troublesome light bulbs, which had short life expectancy, were replaced with light emitting diodes (LEDs). These serve as indicators on the supply/charger and CDSTARS power module for the user to observe charge status. With regards to the duplexers, the Sinclair TXRX and Phelps Dodge Duplexers, all operated with essentially equivalent performance, according to the manufacturers specifications in our tests. Therefore, the ultimate selection of the duplexer manufacturer was left to the competitive bidding process. With regards to facsimile receivers, the Bearcat receiver was judged inadequate for our needs, as was the Weatheralert. The CRW receiver was simply too expensive, therefore, the choice was between the Instalert and Standard receivers. Ultimately, through the competitive bidding process the Instalert receiver proved to be the most cost effective. With regards to unattended facsimile printer evaluation the following notes are offered;

- Alden
- Murihead
- Xerox

Each provided working samples of their equipment for evaluation. Our evaluation was as follows:

- Alden 800 - acceptable for the project, but we did express concern about the life expectancy of the moist paper.
- Murihead Mercury 4 - acceptable, but again concern about the life expectancy of the moist paper, and the narrow width of the recording paper.
- Xerox - Xerox expressed concern to us that they could not come in at the price that we were expecting to pay, but the machine itself appeared to be quite acceptable for our purposes. A special feature of the Xerox machine was the fact that the paper had a lifetime expectancy. This was due to the fact that the Xerox technique used an impact scheme through carbon paper. A drawback to this was that the carbon paper had to peeled back, in order to read the document.
- 3M - While 3M did not provide a sample, they suggested to us that their Magnafax machine was essentially identical to the Xerox telecopier III.

- Graphic Sciences Incorporated - manufacturers of the DEX 3400 and 3000 Series unattended facsimile receivers, chose not to bid our project.
- Datafax Facsimile Transceivers - made by the Stewart Warner Corporation proved to be quite adequate for our needs, providing standard document size, reception in 4½ minutes with totally unattended operation. Ultimately, Datafax was the low bidder through the competitive bidding process.

To power the facsimile machines during power outages, 12 Volt DC to 120 Volt AC power inverters were acquired. This was accomplished through the competitive bidding process and the low bidder was Tripp Light Company. Their address is:

- Tripp Light Company
500 North Orleans
Chicago, Illinois 60610
PV-400

Previous to the competitive bid award, the Micronta, catalog #22-130, a Radio Shack product had been evaluated and specified as the minimum criteria. To summarize the evaluation process, every effort was made to scour the electronic marketplace for the most cost effective solutions to the problems involved in creating a Civil Defense State Radio System.

2.5 MAJOR SOURCE DOCUMENTS

- National Plan for Communications Support in Emergencies and Major Disasters, November 1979.
- Federal Assistance Handbook, CPG 1-3, December 1976.
- Emergency Communications Defense Civil Preparedness Agency, CPG 1-18, January 1977.
- Effects on Communications of North East Power Failure, November 9-10, 1965, prepared for Federal Communications Commission, January 6, 1966.
- Direction and Control Communications to Support Crisis Relocation Planning, Department of Defense - Defense Civil Preparedness Agency, RS 2-A-19, August 1978.
- Emergency Response Communications Program, Report of Interagency Committee for Search and Rescue, Ad Hoc Working Group, Hufnagel Committee, June 1979.

- Operations of the National Weather Service, 1979 Edition.
- Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants, Nureg-0654 FEMA-REP-1.
- Emergency Communications Supplement C2ER500-1-1, New England Division of the Army Corps of Engineers.
- The Role of the Citizens Band Radio Service and Travelers Information Stations in Civil Preparedness Emergencies, Final Report - May 15, 1978.
- The Emergency Role of Amateur Radio, Final Report - December 15, 1972, TM-4877/002/00.
- Emergency Broadcast System, Rules and Regulations, Subpart G - Section 73.901-962 Amended, effective February 1, 1977.
- Speed and Reliability of Inter and Intra EOC Emergency Communications, Defense Civil Preparedness Agency, TR-76, October 1972.
- Communications, CAP Manual 100-1, July 1, 1979.
- Electromagnetic Pulse Protection for Emergency Operating Centers, TR-61A, July 1972.
- Electromagnetic Pulse Protective Systems, TR-61B, July 1976.
- Manual for the Radio Amateur Civil Emergencies Service, MP-60.

2.6 PATH STUDY

Rhode Island lies in the northeastern part of the United States. It is bordered on the west by Connecticut and on the north and east by Massachusetts. The southern edge of the state fronts on the Atlantic Ocean. The coastline of Rhode Island measures more than 400 miles*, if the many bays, coves and offshore islands are included. The greatest length of Rhode Island, from north to south, is 48 miles**. The state's greatest width, from east to west, is 37 miles***. The total area of Rhode Island is 1,214 square miles#, including 165 square miles## of inland water surface. The highest point in

* 640 km

** 76.8 km

*** 59.2 km

3144.26 square km

427.35 square km

the State of Rhode Island is Jerimoth Hill, 812 feet (248 m) above sea level. The Rhode Island Defense Civil Preparedness Agency Emergency Operating Center (EOC) is located in the State Capitol Building in Providence, Rhode Island. The State Capitol Building is approximately 70 feet (21.3 m) above sea level, the building itself presents a platform of 300 foot (91.4 m) above sealevel for two way radio communications antennas. Providence is approximately 12 miles (19.2 km) to the northeast of the geographical center of the state of Rhode Island. The longest VHF paths faced in this project were:

- Block Island - to the south, distance approximately 40 miles (64 km).
- Maynard, Massachusetts - to the north, also approximately 40 miles (64 km).

All remaining paths were less than 35 miles (56 km). The use of phased high gain directive base station antennas atop the State Capitol Dome provided sufficient signal to reach all points in the system. As a counter-measure, stations distant from the State Capitol were provided with high gain directive yagi antennas, aimed at the State Capitol. Whereas, stations in closer to the Capitol were provided with simple single element antennas. In all cases, station power was limited to 20 Watts output, per station. For optimum efficiency, low loss non-contaminating vinyl covered coaxial cable was used at each station. In some cases special signal strength tests had to be conducted to find the most appropriate location for the ultimate placement of the VHF antenna. Only a few stations required such exacting installations. A map indicating the longest paths in the system is appended as Appendix Four.

2.7 SELECTION OF ACTUAL LOCATIONS FOR CDSTARS STATIONS

Selection of the actual location of each CDSTARS Station was based upon several factors. They were:

- Availability of a 100 PF EOC. If none,
- Availability of at least a 40 PF facility. If none,
- Availability of a place where direction and control activities may have recently taken place, such as, during the Blizzard.
- That the place be a municipal facility, where municipal employees normally worked.

- That there be telephone service at this location and preferably emergency power as well.
- That the public not likely have access to the proposed station, except for volunteer operators.
- That a potential path to the State Emergency Operating Center for radio signals be practical.
- That someone agree to answer the tests of the system as a new weekly responsibility.
- That a signed loan agreement be reached between the State DCPA Director, the local Director of Civil Preparedness, with written concurrence (signature) of the head of local government - see Appendix Five, for sample loan agreement).

Selection of the actual location of CDSTARS Cooperating Stations was approached from a different point of view. Criteria for these Stations was as follows:

- Will be there be or has there been a need to communicate with this station during past disasters or other emergencies?
- Does this station have an assigned emergency functional responsibility?
- Would the inclusion of this station on the network be beneficial to the other stations on the network?
- If nuclear fallout protection is feasible at this station, place the station in this area, if practical.
- Security of the installation is important, unauthorized operation shall be prevented.
- As the station remains state property, a loan agreement must be signed by the Agency Head. This agreement is appended as Appendix Six.

A third and final category completes the network, that of Public Utility Stations. Each of these stations, at one time or another required communications with our Agency or our Agency with them. A previous criteria originally used with the Radio Amateur Civil Emergency Service was that Utility Stations purchased their own equipment. This criteria was continued under the CDSTARS program. The following facilities agreed to purchase identical equipment to that

used in the remainder of the network.

- The New England Telephone Company
- The Providence Gas Company
- The Narragansett Electric Company
- The Newport Electric Company
- Blackstone Valley Electric Company
- Valley Gas Company
- RI Public Transit Authority

The Stations were located at Dispatch Centers for the Utilities, to help re-establish communications, especially for recovery efforts. The completed network represents a carefully selected mixture of each local government in Rhode Island, all active Emergency Response Agencies and State Government, utilities on a 24 hour party-line type radio network. The demonstration project has been well accepted by all concerned, and it works.

2.8 CONSTRUCTION AND ASSEMBLY OF CDSTARS STATIONS

It was determined early in the evaluation and procurement stages that rapidly escalating inflation was to eclipse the buying power of the grant funding, so it was decided to use State Personnel to assemble the various components of the system, such as the two-way radio, the duplexer, the interconnecting cables, the facsimile receiver, the power inverter, and other hardware and associated electronics, into a durable, but tamper proof steel case. Student interns, a CETA electronics trainee, the CDSTARS consultants, the State DCPA Communications and Warning Officer and his assistant, all participated in the actual final assembly and ultimate delivery and installation of each station. A photo of a completed final CDSTARS Station Assembly is appended as Plate One. (SEE 4-3)

2.9 OPERATIONAL AND TECHNICAL REQUIREMENTS

It was determined by our consultants that the probability of accidental lengthy transmissions on such a large party-line system could cause problems for the remainder of the network. To alleviate this, only transceivers containing one minute time out timers (TOT) were permitted on the two-way frequency. This means that transmissions lasting more than one minute by any CDSTARS Station are automatically terminated by an internal timer, which is reset once the transmitter is unkeyed. This guards against one of the big problems plaguing radio systems of this type, that of a transmitter accidentally or purposely being left on for long lengths of time, thus disrupting the entire network. The extra cost of this feature proved to be less than \$30 per radio. Because extended local operation of these radios was certain at 40 of the CDSTARS locations, each radio was fitted with a connector, which permitted its functions to be controlled from another location. A copy of the technical specifications submitted to the vendors, for this type of product, is appended as Appendix Seven.

Once installations began, new operational problems surfaced. Mainly, accomplishing daily installations while maintaining a relatively quiet channel for those already installed, to listen to. This was accomplished by using telephone or the facsimile channel for antenna alignment signals, while reserving the voice channel for minimal conversation. This effort to keep chatter to a minimum is important, for all CDSTARS radios were especially modified so that the radios could not be turned off, nor the volume lowered beyond a certain point (see SPECIFICATIONS - Appendix Seven). In that transmissions by the State Control Station are therefore heard at 66 points, such transmissions are always brief and to the point! A CDSTARS checklist used by our installers helped insure that each installation met the requirements of the program and provided an historical record of technical and operational facts at each CDSTARS installation. See Appendix Eight - CDSTARS CHECKLIST.

2.10 OTHER PURCHASE SPECIFICATIONS WRITTEN FOR THIS PROJECT

The following is a listing of additional purchase specifications written for the Civil Defense State Radio System Project.

- Duplexer specifications
- CDSTARS remote control specifications

- Specifications for extended local control desksets
- Specifications for facsimile sending and receiving units, CDSTARS
- Printing specifications
- Technical and logistical specifications for selective call equipment and selective reception for Civil Defense State Radio System, facsimile receivers

2.11 ELECTROMAGNETIC PULSE CONSIDERATIONS

To assure a proper ground at each CDSTARS Station and to provide voltage transient protection, a Hubble, model S291 electric outlet adapter was fitted by our technicians with a pair of General Electric metal oxide varistors, model #VP130A10. When exposed to high energy voltage transients, the varistor impedance changes from a very high standby value to a very low conducting value, thus clamping the line voltage to a safe level. The dangerous energy of the incoming high voltage pulse is absorbed by the varister, thus protecting the voltage sensitive circuit components. The Hubble provided a convenient point at which to ground the remainder of the CDSTARS Station components.

2.12 LICENSING OF THE SYSTEM

Research to find a suitable FCC Service to license this demonstrator program proved fruitless. The only FCC Service which showed promise of supporting a Civil Defense State Radio System (CDSTARS) other than RACES was the local government radio service. Local government radio service would not accomodate the system due to the lack of available frequencies, the problem of frequency coordination (75 mile, 120 km co-channel), and the fact that local government is a land-mobile service, that is base stations are permitted in this service to communicate with mobile units, not other base stations (land). The problems associated with applying for and maintaining 66 separate licenses appeared to represent a monumental paperwork problem and our research indicated that due to the metropolitan aspect and the population density of the state, the FCC would ultimately deny this system a license. Other FCC Services were investigated for possible use, and the only service which appeared practical was the Radio Amateur Civil Emergency Service (RACES). RACES under

the original FCC rules would have been an excellent and ideal service to construct the demonstration CDSTARS System, had it not been for a change in the rules which, as the name implies, now reserves operation of RACES radios by licensed radio amateurs only. For the uninitiated, the FCC rules for RACES originally permitted RACES operation by non-amateurs under a blanket amateur license and the operator by applying for a restricted operator permit was able to gain operator certification. This process was the basis for Civil Defense Communications up until the new RACES rules took effect. The problem with this new arrangement is that licensed amateur radio operators are simply not in abundance in state, local, or support Agencies. This creates a system which must "wait" for operators and this is simply unacceptable. A second, less publicly discussed problem, is that amateur frequencies are readily accessible by thousands of amateurs possessing similar radios, opening a potential for interference and frequency occupancy problems. Both of which have surfaced in the past in our experience with this service. Lastly, RACES being an amateur service lends itself to being a less than professional communications service - that is Civil Defense is relegated to the use of licensed amateurs and their frequencies - while other functions of government are assigned exclusive use of more desirable frequencies and equipment with less licensing restrictions. A sidelight of this is the historical problem this Agency faced with licensed amateurs testing "communications" between the State Capitol EOC and their homes. The intent of a Civil Defense Radio System (CDSTARS) be it on RACES frequencies, local government frequencies, or military frequencies is to provide a means for state and local government to communicate with one another from their respective Emergency Control Centers and with the various support agencies germane to the emergency situation at hand. Having learned that the state of Maryland had resolved some of its communication problems through agreement on the mutual use of frequencies with the Maryland National Guard, it was decided to pursue this course of action to create the demonstration system covered in this contract. The RI National Guard had also had its share of problems with communications, especially during statewide emergencies when its own telephone services were overwhelmed. We approached the RI National Guard with a plan to mutually benefit each other to establish an official business emergency radio communications network among the components listed in Appendix One. While the timespan between our request for the use of the

VHF frequencies necessary for the system was lengthy, the results were most gratifying. A single call sign was assigned to the network (AAB-500) while all other stations were to use what the military calls (PVI) Positive-Voice-identification. This means State Police identify themselves as "State Police", which is their PVI. No complicated technical call signs or other confusing call letters are used. Low power was used at all stations (less than 20 Watts output). The RI National Guard continuously monitors the CDSTARS network for proper operation. A copy of the letter from the State Adjutant General forwarding the radio frequency authorizations and the authorization itself are appended as Appendix Nine to this report.

CHAPTER THREE

COMMUNICATIONS REQUIREMENTS

3.1 COMMUNICATIONS REQUIREMENTS

A historical survey of the communications necessary during past emergencies laid the basis for the communications requirements in the Civil Defense State Radio System (CDSTARS). The requirements were broken down into four categories:

- Political Subdivisions - it was reasoned that every political subdivision should have a means of communication with State government, aside from normal telephone services, for emergencies.
- Supporting services and agencies - in reviewing our records, certain agencies have proved essential to emergency operations, particularly in recovery efforts. Agencies, such as Salvation Army and other support agencies, were never in radio contact with State government (except VIA, telephone services) previous to CDSTARS. It was reasoned, based upon past experience, that fixed in place dependable radio communications belonged at these facilities. The list included components within State government that provide disaster emergency service functions, as well as private agencies, such as Red Cross and Civil Air Patrol, who have helped in previous situations.
- Public Utilities - Until this project was conceived, if you were unable to get through to serving Public Utilities by telephone, the only alternative was to send a messenger, which we have had to resort to in the past. In 1980, having to dispatch a messenger seems a bit archaic to accomplish such a simple task, but in emergencies, even "secret unlisted telephone numbers" are constantly busy, eliminating a vital link particularly in the recovery process. Telephone outages are common in many emergency situations. By inviting the major RI Public Utilities, including the phone company, to be on the system, local communities as well as State government are provided with a back-up means to reach the facilities.

Federal - to interface with the Federal level of government, this State felt that CDSTARS might also be a viable alternative to the Civil Defense National Radio System (CDNARS). CDNARS, which uses frequencies in what is called the high frequency (HF) spectrum has many drawbacks in a State such as ours, which is merely 40 miles (64 km) from the serving Federal Regional Center (FRC). The principle problems are: that of noise and propagation, for any given 24 hour period. The bottom line of these HF systems is that various frequencies are necessary to maintain 24 hour contact, due to varying sky wave and ground wave conditions, which change as the earth turns. Our solution to that problem was to place a demonstration very high frequency (VHF) radio at the FRC and another at our State EOC. This radio circuit remains constant, operates on a simplex frequency and requires no operator actions, other than responding to calls. Compared to the highly technical CDNARS, the CDSTARS can be readily operated by any available person. Also to resolve long standing problems with being able to communicate with the National Weather Service, the local office of NOAA was interfaced into this office, using an ultra- high frequency (UHF) radio frequency, which was acquired for this use by the National Weather Service.

These four categories comprise what the state agency considered to be its operational communications requirements.

3.2 PRE-CDSTARS

Prior to the development of the CDSTARS project, communications with political subdivisions was via the Radio Amateur Civil Emergency Service (RACES). A thumbnail description of that system follows:

- Not all communities possessed RACES equipment. The majority of RI communities had purchased, urged on through the impetus of Federal matching funds, some amateur radio equipment. The majority of this equipment was manufactured by the Gonset Corp., now defunct. This radio equipment should have been placed, in Emergency Operating Centers and fallout shelters, with a protection factor (PF) of 40 or greater, and in many instances this was the case. But, in many more instances, the radios were:

- Stored in a secure area, usually within the EOC.
- Installed in the EOC and the remainder of the units, loaned out to helpful local amateurs, who in turn, provided their services to local Civil Defense. As these radios failed, they were usually returned to the local CD Headquarters, and many remain in that unrepairs state today.

The principle problems with all of this is that the subject equipment has seen its day, the RACES equipment of the past, especially in this state, is obsolete by amateur and commercial standards. The radios were early VHF type, amplitude modulated (AM) units, Whereas, 99% of VHF communications in 1980 is frequency modulated (FM). The shortcomings of these early radios are innumerable. Inensitive receivers, readily susceptible to both off frequency and noise interference, which is generally also amplitude modulated, as well as wide tolerances in transmitter frequency and modulation characteristics, give the functioning of these radios a distinctively poor performance characteristic record. When compared to commercial radios of the same vintage, using FM technology, there is no comparison. The shortcomings in the performance of these radios was compounded by the fact that it really took a rather competent operator to conduct communications operations with these units. As the receivers were tunable, it was a problem to simply locate the desired station on the dial, and the many controls tended to confuse the uninitiated. Compared to the utter simplicity of police, fire, and even taxi-cab radios, these Civil Defense Radios soon became known as being undependable, difficult to operate, and ultimately gave Civil Defense Communications a bad reputation. When one considers that with all the aforementioned shortcomings, this State's primary Civil Defense Radio Communications System was composed of these troublesome radios, it's a small wonder that any system existed at all! The answer of course is the dedication of the loyal Civil Defense Volunteers and restricted operators who, in spite of the shortcomings of the RACES radios, endeavored to make the best of what they had to work with. It was with pride that prior to the CDSTARS program, the RI RACES program, using totally obsolete equipment, managed to conduct over 75 Statewide tests annually, with participation by over 75% of the RI communities, with good representation from supporting agencies and utilities. Annual reports of activity were published and distributed statewide, and a copy of a typical RACES activities report is appended as Appendix Ten. In that RI is not unique among states, the aformentionned problem faces virtually every state Civil Defense Preparedness Agency and the CDSTARS program is this

State's solution to the problem. Certainly required reading for any State contemplating an expanded RACES program patterned after CDSTARS, is TM-4877/002/000, the Emergency Role of Amateur Radio, final report dated December 15th, 1972, especially Chapter Four IV, which deals with the delicate matter of RACES operations.

It should be emphasized that the State of RI no longer uses RACES, but welcomes RACES operators to assist in operating the CDSTARS radio during emergencies. RACES is now relegated to use only in political subdivisions within this state, and with its inherent problems, outlined earlier, continues to be a second-class operation, except where conversion to new FM equipment has taken place. The only drawback in this instance is the FCC requirement for licensed radio amateur operators only! Our local CD Directors ask; what if the amateur operators are not available? They ask; why should our communications be totally dependent upon licensed radio amateurs when volunteer firemen, for example, do not need to be licensed to operate volunteer fire radios? It is precisely sensible questions such as these, which forced this State to look elsewhere to establish a sensible and realistic Civil Defense State Radio System (CDSTARS).

3.3 OPERATIONAL PROBLEMS (PRE-CDSTARS)

Prior to the CDSTARS program, where RACES existed, certain operational problems had surfaced. These will be discussed to show the reasons why certain courses of action were taken, in the development of the CDSTARS program.

- Location of local RACES Civil Defense Radio. Usually in the basement of the Police, Fire, Town Hall or City Hall Building, and for well meaning reasons, as these locations also afford the best fallout protection. By the same token, these locations are also the cellar or basement of these buildings and as such are not generally inhabited. This leads to several complications, the most obvious of which is that in our quest for "hard areas", Civil Defense has managed to become cellar inhabitants, away from the normal flow of traffic in these buildings. Cellars, noted for dampness tend to rust and otherwise deteriorate radio equipment. These out of the way locations have yet another problem, theft.

Theft vulnerability - we have found ready access to these facilities in many instances, as basement security tends to be lax. Because normal business operations for local governments rarely takes place from cellars or basements, it has been difficult to find anyone but Civil Defense types in these areas, and only on occasion at best. This is not to say that basement installations and emergency operating centers are to be avoided, the point is that it is not a place which is usually manned by municipal personnel (once the CD Director leaves the premises). It was not practical under the RACES program to provide extensions or extended local control to "manned areas" due to the complexity of the radios in RACES and the licensing problems mentioned earlier. Thus RACES radios had to be operated from the basement locations of these stations.

Visibility - our periodic visits to political subdivisions revealed that rarely did local officials realize that a Civil Defense Communications capability existed, even in the best equipped communities. Notably, Town Council Presidents, Mayors, Heads of Local Government were generally unaware of these CD Communications Systems, which were purchased long ago and rarely used except for tests. Without use, these communications systems, regardless of how good they were or are, eventually became invisible. It was for these reasons that bold, prominent marking was decided upon to identify the CDSTARS radio equipment, as well as require that the head of local government sign the CDSTARS loan agreement. This was added assurance that the head of local government was made aware that an inter-governmental radio network existed and its purpose. Every effort was made to correct the poor visibility problems of the previous RACES program.

Funding - local Civil Preparedness Agencies can not realistically be expected to be part of such an excellent communications program, such as CDSTARS, when one considers the meager amount of local funds that are budgeted for Civil Preparedness purposes. Aside from token amounts budgeted for salaries of part or full-time local directors and routine expenses, such as telephone services etc., the monies which remain for acquiring new Civil Defense Operational Support equipment, even with the prospect of 50% Federal re-

imbursement, is next to nothing. This is why CD equipment has fallen into such a state of disrepair and unreadiness, while new communications equipment acquisition is virtually at a standstill. Civil Preparedness Direction and Control Operations without an adequate communications system is nearly impossible, yet funding priorities and matching fund percentages fail to reflect its true importance. Stranger still are the Federal Emergency Management Agencies (FEMA) program paper elements which fail to ask a single pertinent question about communications capabilities, operations, and tests other than the status of planning paperwork.

Local Maintenance - a word should be said about local maintenance of Civil Preparedness Communications equipment, while there is a volunteer local radio officer in nearly every political subdivision in RI, the maintenance of local systems, especially without funds, should not be the responsibility of that local radio officer, unless local conditions are unique. For example, one would not expect volunteers to be maintaining fire or police radios, why then expect Civil Defense radios to be treated in this manner? It takes thousands of dollars of sophisticated test equipment to provide the maintenance and calibration required for communications equipment not likely to be found in most communities, particularly the smaller ones. It was for this reason therefore, that the State elected to maintain the entire CDSTARS system once it had been installed, for proper maintenance and calibration of this equipment is absolutely necessary if high performance is to be expected from such a system. The capability for this type of repair capability simply does not exist in most communities, nor does the budgeting for the costs incurred.

3.4 SCOPE OF OPERATION

Many communities who developed RACES programs in RI, had misconceptions as to the nature of the type of communications that such a system would encompass. RACES has a clearly defined listing of permissible communications, quoting Section 97.191 of current FCC rules and regulations: "Communications in the Radio Amateur Civil Emergency Service must be specifically authorized by the Civil Defense Organization for the area served, stations in this service may transmit only Civil Defense Communications of the following types:

- Communications concerning impending or actual conditions jeopardizing the public safety, or affecting the National Defense of Security during periods of local, regional, or National Civil Emergencies Communications directly concerning the immediate safety of life of individuals, the immediate protection of property, maintenance of law and order, alleviation of human suffering and need, and the combatting of armed attack or sabotage.
- Communications directly concerning the accumulation and dissemination of public information or instructions to the civilian population essential to the activities of the Civil Defense Organization or other authorized governmental or relief agencies. Communications for training drills and tests necessary to ensure the establishments and maintenance of orderly and efficient operation of RACES as ordered by the responsible Civil Defense Organization served.

Many communities, apparently "intimidated" by these rules avoided RACES due to concern about the legality of its use, while other RACES operations turned out to be "ham" stations for the amusement of local volunteers, perhaps as a reward for volunteer efforts.

3.5 EMERGENCY POWER

The great Northeast power failure of November 9-10, 1965, was documented in the study on the subject, prepared by the National Industry Advisory Committee (NIAC) for the FCC, the observations and conclusions contained therein, tend to remain true today, but there have been major improvements in many cases. Mainly, this office notes that statistically speaking, most communities look good on paper, readily responding yes to the question of "Is emergency power available"? Upon closer inspection, however, there are serious reservations to these yes answers. These will be covered next:

- No regular testing program in place i.e.; weekly start-up and generator test.
- Generator never subjected to long trial (24 hour) therefore overheating and air volume requirements unknown.
- Generators not switched to accept load, so it remains unknown as to whether the generator can readily carry the "load" which has developed since initial installation.
- Stale gasoline, varnish build-up in carburetor and storage tank, corrosion on battery terminals and loss of electrolyte are all common problems with emergency power plants.

- With manual systems, the requirement for a specific individual to be present to start the engine and manually operate the changeover switch becomes a problem. Written standing operating procedures (SOP) would be helpful, but training of back-up operators is the ultimate solution.
- We have found liquid propane gas (LPG) to be the most effective, long term storage fuel source for emergency power plants.
- We have discovered that most so-called "trickle chargers" tend to boil away battery electrolyte and tend to ruin the battery prematurely, which is absolutely necessary to start these emergency power plants. Our CDSTARS experiments revealed a better method which ultimately used a CDSTARS power module to safely charge and maintain a demonstration emergency power plant battery.
- Is there an adequate on-site fuel supply and is the fuel turned over in such a manner so as to prevent build-ups of varnishes?
- If the locality has a stand-by unit, has it ever been tested? Are there suitable connections for the generator? Is it indeed a 60Hz unit, and does its output match the requirements of the facility it is to serve?

For the aforementioned reasons it was decided that for system uniformity a CDSTARS power module totally independent of questionable emergency power plants be used to power the demonstration Civil Defense State Radio System.

3.6 OTHER OPERATIONAL CHARACTERISTICS

Another problem noted during our years of experience with RACES was that once tests were completed, the radios were shut-off by the operators until the following week. This rendered the RACES useless until someone actually returned to turn the radio back on. It was decided therefore, that based upon the fact that the new CDSTARS package was of modern design drawing very little current in the dormant "listen" state, that the radios would be left ON at all times. To accomplish this, both the two-way radio and the facsimile receiver were installed with

the ON/OFF switch defeated. Further, the minimum volume of the radios were specified to be set at 10% of the full audio capability. This prevents the volume from being set so low that important calls are missed. These practices, long accepted in certain police and fire communications installations, appear to be long overdue in a Civil Defense Radio System.

3.7 COMMUNICATIONS PLANNING

RI is in Region One, which according to "The Role of Amateur Radio" study TM-4877/002/00, accounted for better than 1/3 of the accomplished RACES plans in the country, 40 of which (100%) reflected RI's RACES planning effort. Admittedly, these RACES plans were merely a series of statements about the locations of RACES stations, the assigned frequencies of operations, and other localized facts, but these plans did at least force the issue of establishing a local control point from which to operate RACES. This one fact was worth the planning effort by itself, but even more valuable was the factual information these elementary plans presented when communications plans for Civil Preparedness were developed for all RI communities. At this writing all communications plans in RI are current, being less than two years old and reflect present information, including CDSTARS and its purpose. In addition, local communities continued to use RACES and this information is also contained in these plans. The State Communications Plan is current, having been completely rewritten and distributed in November of 1979, as well as the interwoven Warning and Emergency Broadcast System (EBS) plans.

3.8 THE VOLUNTEER RADIO OPERATOR

The RI RACES program, pre-CDSTARS, was composed of a devoted and loyal group of volunteers, about 50 of which might have been considered "active" out of a total statewide enrollment of 1100. These volunteers regularly manned the RACES radios at the appointed times of Civil Defense Tests and exercises and represented a considerable number of man hours expended by these people. With the rising costs of fuel and local reimbursement of such travel practically unheard of, this office could only foresee a future when volunteers simply could not afford to continue the practice of leaving their homes, driving to the EOC and returning 78 times a year. No one is to deny that regular

tests are necessary, our records clearly indicate this is a minimum level of activity if one is to have a viable communications system in readiness. However, to expect that 50 or more volunteers should leave their homes, especially during the winter months, merely to verify radio performance appeared to this author to be a waste of talent and energy. We advised the loyal following of the State RACES program that routine testing of the State to local RACES equipment would end when the State RACES license expired. The State chose not to apply for the new WCl-type RACES license though several RI communities did for their own local operations. We explained to our volunteers at conferences and in direct mailings that routine tests to determine radio operability would be transferred to a paid municipal person in each community, thereby freeing the volunteer of the weekly obligation. We asked that the talents of these operators be reserved for use during emergencies, and to report to the local CDSTARS location to either take over, or assist in the operation of the local CDSTARS station. We reasoned that in many communities, between the volunteer and the paid operator, the possibility of 24 hour coverage during an emergency at least looked promising. While larger communities are staffed 24 hours a day in most CDSTARS locations, during widespread emergencies, we still feel our volunteers would be welcome to operate not only the CDSTARS radio, but knowing the dimension most of our former RACES operators have, would no doubt be useful as relief operators for other dispatch requirements. This is, we think, a more efficient use of this volunteer resource, while at the same time, bringing into the picture local government personnel whom here-to-fore had essentially been overlooked by Civil Preparedness.

3.9 PRE-CDSTARS SELECTION OF LOCAL COMMUNICATIONS CONTROL POINT PROBLEMS

The selection of local communication control points which are not necessarily called Emergency Operating Centers (EOC) is worthy of discussion here. This is because we have noted that in all too many cases, out of the way Emergency Operating Centers are not consistent with local government's actual decision making headquarters. This is due mostly to the strict requirements for fall-out protection for Civil Defense Emergency Operating Centers. Other emergency recovery efforts not requiring this particular protection however, are generally directed and controlled from other locations. Though difficult to justify, it appears that local communities would resort to using a Civil Defense EOC only if a radiological hazard existed.

This appears to be due to the basement locations which are in some cases totally divorced from the seat of local government.

An example of this in our state is the town of Narragansett which constructed with Federal financial assistance a 100 protection factor (PF) EOC in the basement of its High School, while the Town Hall, Police and Fire Headquarters, as well as the offices for Civil Preparedness were built in another structure over a mile away. It is obvious that direction and control for this coastal community would take place from this consolidated public safety building, except during a nuclear hazard.

When a planner considers the choices:

- The unmanned basement EOC of a High School,
- The 24 hour coverage afforded by a combined Police/Fire Public Safety Complex which also houses the seat of local government, the planners ultimate choice should be obvious.

Unfortunately that choice is not consistent with the Federal Civil Preparedness Guide (CPG1-3). While no attempt is being made to suggest that changes be made to the guide, the realistic facts are as outlined above. So the example community Narragansett, as so many other communities in America, have two direction and control centers: 1) for non-nuclear emergencies, and another for a nuclear emergency, which affords some degree of fall-out protection. This town was used as the example because the two locations are a mile apart from each other. In many cases, fortunately, the two direction and control centers are in the same building, but on different levels. In either instance, the problem facing communications planners is:

- Should there be duplicate communications equipment at both the nuclear and non-nuclear EOCs?
- Should one EOC house the actual communications transceivers and the other location operate this equipment remotely?
- What level of telephone services should each of these facilities have?
- What security precautions have been taken to protect these communications resources?

- What is the vulnerability of this arrangement should telephone lines be damaged; i.e; earthquake, ice storms, hurricanes, etc.?
- What is the accessibility of the facilities at odd hours?
- Does emergency power exist and what is its dependability factors?

These subjects were reviewed in this section for these factors all had to be weighed in determining the best location for the new CDSTARS. The solutions chosen will be covered in the next chapter.

CHAPTER FOUR

CIVIL DEFENSE STATE RADIO SYSTEM (CDSTARS)

4.1 DESCRIPTION OF CIVIL DEFENSE STATE RADIO SYSTEM (CDSTARS)

The RI Civil Defense State Radio System (CDSTARS) was originally conceived as a demonstration prototype model showing the practicality of creating an adequate and dependable wireless, voice and record copy communications system for Civil Preparedness Operations. This system was to establish an effective voice and record copy capability between all the local governments and the Emergency Response Agencies as previously identified under Chapter 3.1, Communications Requirements. The missions tasking required that the Direction and Control of these demonstration network be from the State of RI Emergency Operating Center in the State Capitol Building, Providence, RI. Also required was that the same capability be practical from yet another location outside the metropolitan area. A portable relocatable unit was constructed to accomplish this. Several sites were identified as relocation points, mainly exemplary local Emergency Operating Centers having protection factors of 100 or greater. This portable unit is carried in the State Mobile Communications Unit and serves the dual function of providing local signals necessary for troubleshooting and maintenance. The demonstration system was to be a two-way voice radio system with no more than one unit assigned to each local community and cooperating agency. The entire station was to remain the property of the State of RI and as such, the State assumed maintenance of the entire system. This means that 60 some odd stations were added to the workload of the two-man State CD technical staff, above and beyond the normal technical work. But based upon our findings, local maintenance of Civil Preparedness Communications equipment had not been acceptable. This is due mainly to few communities having radio technical personnel on the payroll and local budgets being so low that expensive repairs were simply unaffordable.

The demonstration station for each community and cooperating agency was identical with two exceptions:

- The facsimile receiver (which is hidden inside the cabinet) is unique to each particular station.
- The two-way radio contains a special automatic identification module which is unique to that particular station.

Therefore, an exchange of a defective base station is practical, once the two unique features are exchanged, on site. This permits returning the defective component of the station to the State Capitol where it then can be given the benefit of our rather elaborate repair and calibration equipment and technical expertise. Where practical, repairs have generally been accomplished on site. Actually, repairs have been the least troublesome part of the CDSTARS, as the equipment has proved to be quite durable and dependable. A photograph of a complete "typical CDSTARS installation" is shown in Plate One. Desks were provided by the location, therefore the appearance of each station varies. In all cases however, the station consists of:

- A CDSTARS RF module, this module consists of a single frequency VHF FM 20 watt two-way radio, a single frequency, tone controlled VHF facsimile signal receiver, a 12 volt to 110 volt power inverter, and a duplexer.

A photograph of the CDSTARS RF module is shown on Plate Two.

- A CDSTARS facsimile unit, which connects to the RF module for signal and power sources, and contains a 100 foot roll of paper for unattended record copy capability, is used for receiving maps and messages as transmitted by the State Emergency Operating Center.

A photograph of the CDSTARS facsimile unit is shown on Plate Three.

- A CDSTARS power module, which contains a lead-calcium "maintenance free" battery, a fuse, and a light emitting diode "LED" low voltage indicator, was developed by our technicians to meet the requirements of a reliable CDSTARS power source.

A photograph of the package, in its final state, called a "CDSTARS power module" is shown as Plate Four.

- CDSTARS extended local control, (ELC) was the solution to providing communications in some 40 of the 60 stations where the basement EOCs were unmanned and therefore away from local personnel who usually were elsewhere in the same municipal buildings. These extended local controls may be used up to 300 feet* away from the physical location of the CDSTARS RF and power modules. These units also provided an extended signal path for the facsimile unit which can optionally be plugged into

* 91.4 m

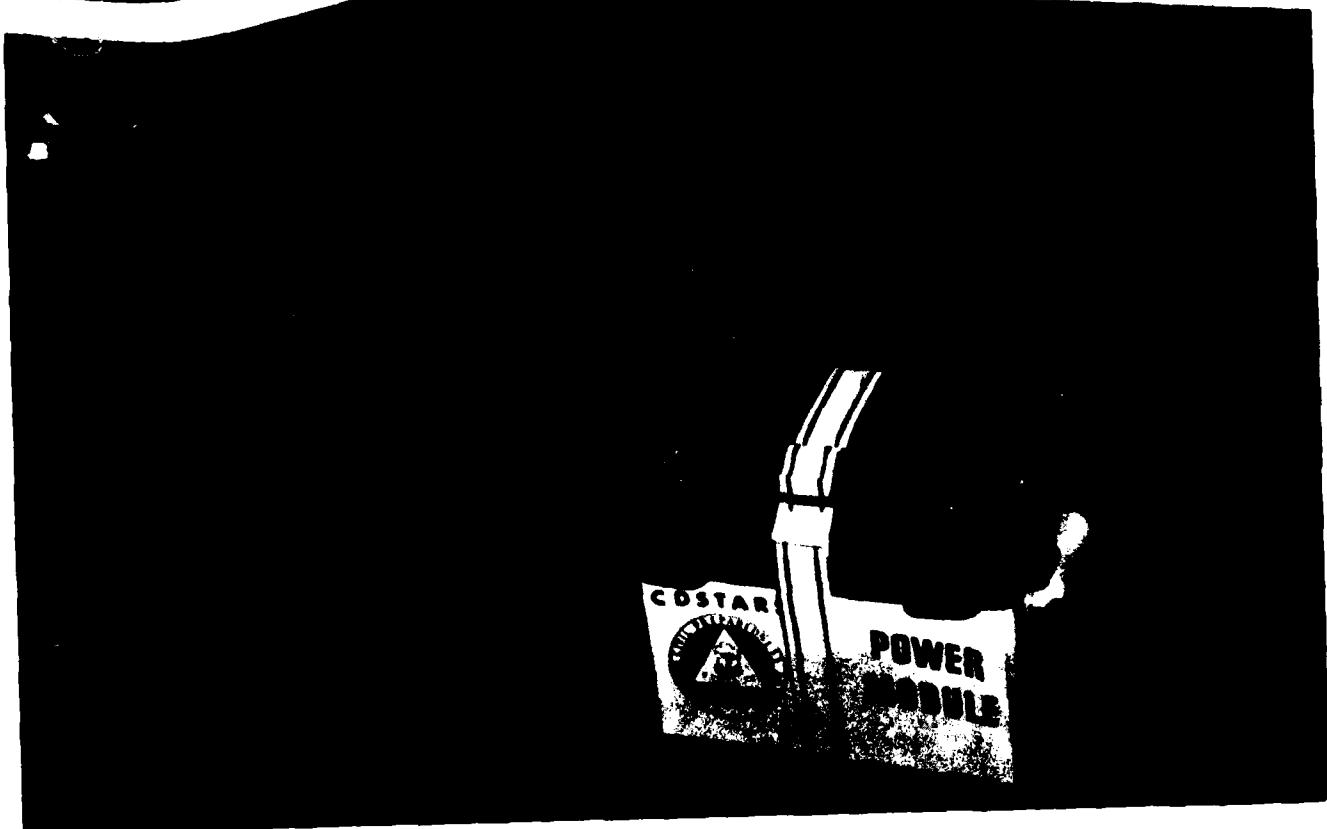


PLATE 1 - COMPLETED FINAL CDSTARS ASSEMBLY (TYPICAL LOCAL STATION)



PLATE 2 - CDSTARS RADIO FREQUENCY (RF) MODULE



PLATE 3 - CDSTARS FACSIMILE UNIT (UNATTENDED RECORD COPY)

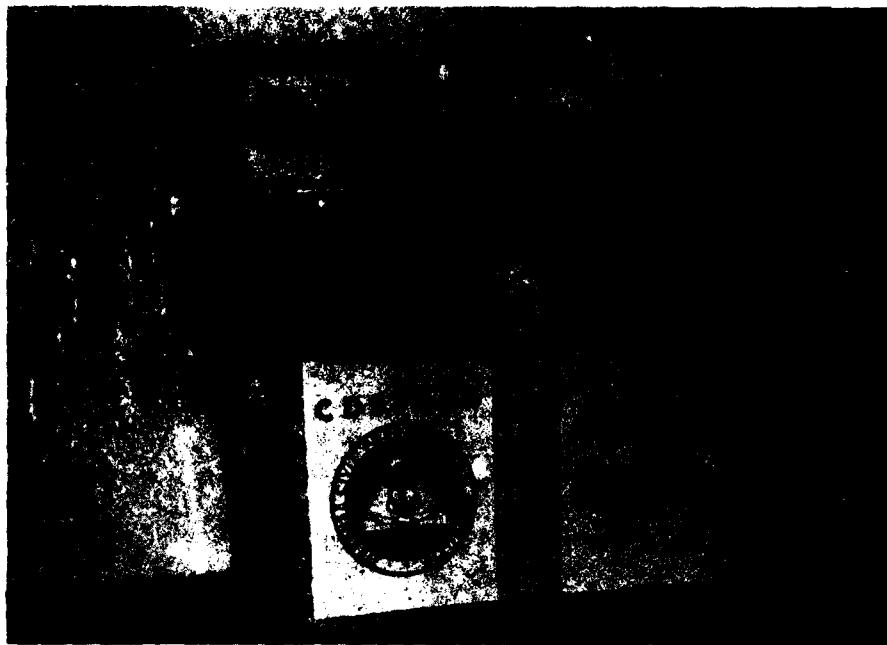


PLATE 4 - CDSTARS POWER MODULE (BATTERY OPERATION)



PLATE 5 - CDSTARS EXTENDED LOCAL CONTROL (ELC)

the rear of the ELC.

A photograph of the CDSTARS extended local control is shown as Plate Five.

- The control point of the CDSTARS consists of several DC remote control sets operating in a parallel configuration. The principle operation of the CDSTARS takes place from the state of RI Emergency Operating Center TeleCommunications Center and this is duplicated in the office of the author, who is the senior Telecommunications and Warning Coordinator on the State Director's staff. Another extension of the CDSTARS voice system appears in the State Director's Office, and at the Emergency Operating Center switchboard. Plug in remote units are stored for use to permit both monitoring and transmitting functions from the Operations Room and/or Staff Office area, as ordered by the Director.

Pictured in Plate Six is the main CDSTARS control point in our telecommunications center. (Note the simplicity of operation).

- The facsimile record copy control point consists of a facsimile sending unit which optically scans the document to be transmitted and produces tones which represent the printing on the message, a tone encoder, which is used to:

- All call "turn on all facsimile receivers/printers" - A1
- Call in selected groups
- Call individual station
- Turn off all facsimile receivers/printers - A10

A surplus audio mixer which is used to set the levels of the facsimile tones and that produced by the tone encoder and a DC remote control unit (surplus) round out the facsimile record copy control point. A photograph of this portion of the system is shown as Plate Seven.

Not shown is the business end of these control points which is located some 700 feet (213 m) away in the top of the State Capitol Dome in a locked cabinet. The cabinet contains:



PLATE 6 - CDSTARS STATE CONTROL POINT (VOICE)



PLATE 7 - CDSTARS STATE CONTROL POINT (FACSIMILE SEND)



PLATE 8 - CDSTARS ANTENNA, AUTHOR, AND VIEW FROM STATE HOUSE DOME

- Two-way radios
- Television transmitter
- CDSTARS power modules
- Remote control interfacing units
- Status alarms
- Telephone communications - to expedite repairs

The system is linked to the TeleCommunications Center by several multi-conductor cables. Special band pass filters were used to eliminate slight interference problems between the voice and facsimile systems. The radios used at the dome location are identical to those used in the remainder of the system. The antennas selected for the CDSTARS were chosen after testing several models. The principle problem was to find an antenna which provided sufficient gain, yet blended into the esthetic beauty of the marble domed State House, without protruding above the parapet. We noted the Phelps Dodge Stationmaster we had originally intended to use exceeded the height of the parapet. This made the antenna too obvious. We settled upon the Hustler Model G6-147, which though shorter in length, produced excellent signals over the 20 mile (32 km) test path. A picture of the author and that antenna atop the State House Dome appear in Plate Eight.

Too difficult to photograph are the remaining antennas, but they consist of a pair of Phelps Dodge Model, Catalog #220, folded dipoles, which are fed out-of-phase to produce north and south lobes, with a resulting sacrifice in east/west performance. The aforementioned Hustler G6-147 was fed out-of-phase to an identical unit to create the same pattern as produced by the Phelps Dodge array. The antennas were mounted carefully above one another to produce minimum interference, as the Phelps Dodge antennas carry the facsimile transmissions, while the Hustler antennas carry the two-way voice signals simultaneously (duplex). As with any duplex system, several different schemes were tried until consistent success was achieved. As every installation has its own local characteristics it would suffice here to note that the antennas selected were based upon the following criteria:

- Height and mounting limitations
- Distance between antennas very close
- Every effort made to "hide" the antennas from the public eye.

- Phasing of the antennas absolutely necessary to cover the entire state; single antennas did not do the job.
- Low-loss co-axial cable a must, even our short runs under 100 feet (30 m) contributed losses to the system. Each cable was measured for losses and standing wave ratio readings recorded.
- Willingness and time to experiment absolutely necessary to optimize performance
- Two important facts regarding duplex antenna systems:
 - The frequencies should be separated as far apart as possible and the antennas should be separated in the vertical plane by the distance which produces no measurable degradation.
 - As horizontal antenna separation requires much greater spacing for equivalent results, horizontal spacing was ruled out for this project.

4.2 CDSTARS - THE INSTALLATION PROCESS

It was originally thought that outside vendors could be called upon to deliver and install the CDSTARS stations, but several factors surfaced during our study which led us away from using vendors for installations:

- Insufficient funds - the costs of having private two-way radio firms do the the installations would have caused us to exceed our budget.
- State/Local contact - funds notwithstanding, we learned that when our State technicians followed through on the arrangements and agreements reached at local stations through our consultants, the system was received more graciously, than if a private vendor had done the work. We found a genuine interest in our system and a desire to talk about Civil Defense in local communities and training was also conducted on the spot by our offices representatives. It took over a dozen individuals to accomplish the statewide installation at the 66 stations in the system. These individuals were:

- The State Communications and Warning Officer and his Assistant
- The Comprehensive Employees Training Act (CETA) Electronic Technician Trainee
- Two technical consultants hired under this contract who volunteered extra-personal time to assist in completing the installations
- Several young men were loaned to the Agency by other State Departments to help us with the project
- Several additional young men were provided to the Agency for two consecutive summers by the Governor's Summer Intern Program to help produce the CDSTARS components, then deliver and install these stations statewide.

The only labor fees charged to this contract are that of the two technical consultants for their consulting services, field work, and assistance in developing this final draft. The remainder of the secretarial, administrative, and technical services were contributed to the project by the State of RI. These facts are brought out to point out that the CDSTARS represents a group effort of a large number of individuals whose labor costs are not shown in this project. It is assumed that RI is not unique in being able to muster assistance from others when needed. Another point worthy of note, this office is now operating its second Mobile Communications Unit, the first having been retired from service at the beginning of this contract. The importance of a flexible vehicle such as this must be stressed! Though ours is an excess property former MP Prisoner Van, it has been repainted blue and is appropriately lettered which helps to identify our personnel and presence in the field. But most importantly, the van carries the equipment necessary to do the work of installation and maintenance, such as spare antennas, cable, hardware, power modules, facsimile units, RF modules and test equipment and so on. Without such a vehicle, it would have been impossible to install or provide maintenance to the CDSTARS. It is hard to imagine a working State CD Communications Department existing without such a vehicle.

4.3 NETWORK DISCIPLINE

Once the CDSTARS network was installed and operational, several facts had to be considered regarding operations. Our consultants with a combined experience of over 75 years in the Public Safety Communications field, found that previous similar systems, such as the Inter-city Police and Fire networks had come to be plagued by:

- Overzealous talkers who monopolized the channel
- Unidentified illegal transmissions, sometimes containing profanity
- Accidental or purposeful transmissions thus jamming the partyline system rendering it useless

To avoid or minimize these problems, the following technical and tactical precautions were taken:

- Each unit was equipped with a time out timer (TOT) to end transmissions automatically one minute after they begin
- Each unit was equipped to automatically identify itself in high speed morse code the moment the microphone push - to-talk (PTT) switch was depressed. This not only identifies pranksters but also helps the State Control Station to conduct the network in an orderly fashion, should the calling station fail to use the positive voice identification (PVI) system.
- Each unit was identical in power level, so that no one station could totally dominate the network.
- The State Control Station sets the example by keeping its transmissions official in nature and brief, and by transferring to telephone any communications that does not belong on the CDSTARS network.
- By bearing in mind that all State transmissions are received statewide at an audible level and are a reflection upon State Government and its Civil Preparedness Program -(in other words no nonsense) Careful attention is given to the content of every message transmitted on the system. Every effort is made to keep the

network quiet until needed. This discipline seems to have had the desired effect, that is we find units are left on 24 hours a day providing a link from state to local governments that here-to-fore had existed essentially only through telephone services. We have noted little operator difficulties with the system, probably due to its inherent simplicity and with the general public's new understanding of Citizen's Band and other radio services perhaps through television viewing. The principle problem, that of failing to identify, is resolved by the automatic identifiers

placed in each radio, therefore in all cases, even the most uninitiated operators were able to make themselves clear over the system. The push-to-talk (PTT) operation did not seem to baffle anyone. This confirmed our earlier suspicions that no special talent is needed to operate a two-way radio, provided the system it is on maintains discipline and that the unit itself is simple to operate. We, as an Agency, are always quick to respond to all calls regardless of the nature and then follow-up telephone calls are made to the operator, if necessary.

Local Directors of Civil Preparedness are consulted should improper operation be noted. Relocation of the CDSTARS operating point may be the only solution in certain cases, while the fact that the culprit is identified in other cases simply ends the problem. In any case, discipline problems on a circuit of this size, left unchecked, will lead to its demise.

4.4 ABOUT LOCAL MAINTENANCE

Many communities, some with repair shop facilities larger and better equipped than ours suggested that they be permitted to accomplish their own maintenance on the CDSTARS radio equipment. We gave careful consideration to these requests and chose not to allow it, but rather retain the entire maintenance requirement through our own Agency. The reasons are as follows:

- Few technicians were familiar with the radio selected and there seemed to be a tendency for these well equipped communities to tamper with our stations. Several transceiver failures were noted in communities having full-time communications maintenance operations.

- We were concerned local technicians would attempt to defeat our time-out timer and automatic identifier provisions.
- We tried to keep our operating frequencies confidential so as to prevent duplicate stations from appearing on the channel. One unfortunate incident which happened recently will help the reader understand our concern. A local amateur radio operator who no doubt learned our operating frequency through the use of a frequency counter placed our operating frequency in his synthesized radio's memory bank. Then, he inadvertently called up our operating frequency and managed to disrupt the network in over a dozen communities. This operation was of course illegal, but most of all harmed two years of the quiet discipline our Agency had worked so hard to achieve. If we had known that amateur synthesized radios were to be produced to reach our operating frequencies, we would have chosen a different voice frequency. There is no doubt in our mind that this accident will be repeated, if not by this operator certainly by another. We still think keeping the equipment tamper-proof, and the frequencies of operation a mystery is to the systems ultimate advantage.

4.5 CDSTARS - RECORD COPY CAPABILITY

It was apparent from the beginning of this project, just as it is in our own office, that there are times when in spite of the precautions taken by Communications planners the subordinate CDSTARS communications stations may be left unattended. This is especially true in smaller communities; but is also the case when local dispatchers become overwhelmed and simply can't handle all duties. This is especially true during emergencies. To cover these situations and provide a method of delivering written messages, maps, and official documents to attended and unattended stations, CDSTARS facsimile units were placed at each station. These units are actually transmitting units as well as receiving units, but due to the length of time messages would take to be transmitted if the entire network began originating facsimile traffic, it was decided to disable the transmit capability by simply placing the nameplate over the feedslots as pictured in Plate Three. Also, transmission of facsimile from subordinate

stations would have required a second transceiver at each site, something which would have created new technical and cost problems which would have caused the costs of the demonstration package to skyrocket. It was determined that there would be four types of facsimile message calling arrangements:

- All points on (all stations' facsimile units on)
A1
- Group call (groups "A through I", consisting of 8 stations per group) That would be B1, C1, D1, E1, F1, G1, H1, I1.
- Individual call
- All points off....A10

These functions are controlled by the State CDSTARS operator who simply depresses the appropriate buttons and immediately upon hearing the completed calling code inserts the document into the facsimile sending unit, which scans the message and converts same into audio sounds which are reproduced on the companion facsimile units in the system. The speed of this system is 4.5 minutes per **standard** document; when messages are close spaced, typewritten, this equates to a words per minute (WPM count) of about 300 or 3 x faster than the Civil Defense National Teletype System (CDNATS). As one would imagine, such a system can also be valuable in the sending of maps and drawings, official proclamations, messages containing actual signatures, etc. During our evaluation of the system, we have even succeeded in sending photographs over the system, though it was never expected to work, certain well defined photographs reproduced surprisingly well at the CDSTARS test stations. We learned that with facsimile, the contrast of the printed material to the background white paper is of great importance to the quality of the reproduction. Heavy black large characters (All capital letters) on white paper reproduces best on the system, while signatures and the like should be made with felt tip black pens. Our system has difficulty recognizing blue and other colors. Each machine was equipped with a roll of perishable facsimile paper. The life expectancy of a roll of this paper, once placed in the machine's humidor cassette, is less than 3 months. Here in lies the biggest problem we have faced with the system. With facsimile paper selling at about \$10 a roll, this office is reluctant to send messages

unless they have significance, except for weekly tests, then again if the system is not exercised enough the paper will simply perish due to old age. What occurs is the chemicals in the treated paper evaporate and the message reproduction capability is lost should the paper dry out. Our technicians have tried a dozen schemes to attempt to preserve the life of the paper including refrigeration, adding moisture to the inside of the cassette, and other attempts of rejuvenation of dried out paper, all with relatively little success. Best performance is achieved when a fresh roll of facsimile paper as supplied by the facsimile manufacturer is placed in the machine. This vendor permits individual stations to order single rolls as needed direct from New Jersey. A document we circulated to that effect is attached as Appendix Eleven, letter to CDSTARS Stations, re: Facsimile Paper.

4.6 WEEKLY TESTS

In order to be certain every station in the network is operational, a complete station-by-station test is conducted every Tuesday morning at 9 AM, except holidays. Every effort is made to be prompt and quick, but efficiently ensure that each station is operational, both the two-way and the facsimile are checked in these tests. A log of these tests is made and is the basis for a series of telephone calls which follow every test of the network. A typical test is as follows:

- "Test Civil Defense Network, Test - This is the State of RI Defense Civil Preparedness Agency, State House, Providence, with the weekly test of the Civil Defense State Radio System (CDSTARS) to all points, for December 30th, 1980. Stations, please stand by for role call"

We then proceed to call all 66 stations individually and record the results on our log. The results of a recent test log is appended as Appendix Twelve.

Standard operating procedure is to place telephone calls to the stations that did not respond, and to those who indicated problems during the role call. This process is necessary to insure that stations that may have responded and simply were not heard by our control station, get a follow-up phone call. To assist CDSTARS operators, our control station dispatcher acknowledges all stations heard; stations not responding to the role call are announced as "negative response" on the network. In this way, the operator should immediately

know the status of the station as a result of the test.

Rarely do we find non-responding stations calling in for service, so we make it our business to follow-up on all negative responses. It generally takes a few hours to check each and every problem thoroughly, and it is a weekly duty of our State Telecommunications Center to accomplish this. Service calls are generated as a result of these tests and follow-up telephone calls.

The success we have had with this program we think is directly related with the thorough testing and maintenance program conducted with vigor and enthusiasm during the evaluation. Now that the stations on the network are aware that failure to participate in a CDSTARS test means a telephone call from the State Control Point is inevitable, nearly all stations routinely respond with the information needed during the role call weekly test.

4.7 SERVICE TELEPHONE DATA AND HISTORY RECORDS

With over a year of practical experience with this Civil Defense State Radio System, several facts have been learned which will be shared here-with:

- The telephone numbers of the telephones nearest the CDSTARS station are necessary in order to conduct as much pre-service call dialogue with the CDSTARS operator as possible. We try to resolve problems over the telephone by having our technicians talk with the CDSTARS operator prior to making a service call. In many instances these calls resolve the problem thereby saving time and energy.
- Contact persons - when making these calls it is necessary to talk to persons who are aware of the system and might help in troubleshooting problems reported during tests. While there is an ever changing personnel problem in a state-wide network such as this, knowing the names of these people helps to save time when calling.
- Service cards - as exchanges of equipment may occur at these stations, information as originally compiled on the CDSTARS checklist (see Appendix Eight) may become stale or incorrect. Service cards are maintained indicating directions on how to find the facility where the CDSTARS Station is located,

whom to contact, exact location of the station and if applicable the extended local control location, type of antenna in use, actual serial numbers of all equipment on-site, and any other facts which may be of value to our technician. Duplicate sets of these service cards are maintained in the service vehicle and at the State Control Point. We also note on these service cards the name, address and telephone numbers of the local Civil Defense Director and when practical, he is advised of our visits to the station and invited to be present during our service visits. The reality of this is that most directors are volunteers and though interested, would prefer not to be bothered to merely observe a service call. We try to keep directors abreast of the performance of the system, especially if a problem persists. The local director can be very instrumental in resolving these problems.

4.8 USES OF THE CDSTARS

No sooner were segments of the CDSTARS installed than was its usefulness brought into focus. A few of these instances are recalled:

- Telephone Company computer and back-up computer failed - telephone services to two major utilities, two police and three fire departments and 5000 homes were totally disrupted for a 4 hour period. This event occurred during a visit by Federal officials who were inspecting CDSTARS and provided a graphic demonstration of its capabilities.
- During every power failure this past year, and surprisingly nearly every community has had a failure at least once, CDSTARS performed when other systems failed, gaining notable credibility for the system. During a power outage in a major RI town, a dispatcher called into State Control to advise of the outage and added "This is the only radio working, we are sitting here in the dark". In another instance, the system was used during a power outage to request that we place a telephone call to that hospital's maintenance man to check why their generator failed to start. We asked courteously "Why the call could not be made from their own switchboard", only to discover that their newly installed latest type telephone switchboard requires commercial or emergency power generation to function. (This confirmed our earlier decision to retain our old battery operated switchboard).

We notified the local police department who in turn transported the maintenance man to the hospital to correct the emergency power generator problem.

- A major city on the CDSTARS called in to report that a man was trapped in a car accident with live electrical wires draped over the vehicle making extrication imposssible. The telephone circuits to the utility were busy, so CDSTARS was used to summon utility emergency crews to the scene to affect the rescue.
- National Weather Service learned of 90 miles (14.4 km) per hour wind gusts from its own communications systems at Windsor Locks, Connecticut. These high winds were later confirmed as a tornado. In a matter of minutes, CDSTARS was used to pass a high wind warning state-wide, both fax and voice. The RI Air Guard and local airports credited this warning with saving airplanes which were quickly tied down and saved from damage. In addition the Department of Environmental Management Enforcement Division who patrol the State Parks advised this office that warnings were issued to campers in State Parks within minutes of our CDSTARS announcement. Since this occurrence, National Weather Service has added CDSTARS to its resources for disseminating warning information due to its simplicity, speed, and wide coverage. (It should be pointed out here that CDSTARS is a communications system, but is not the State's primary warning system).
- A local police department unable to get through to the power company by telephone successfully used CDSTARS to report arcing downed wires which posed a hazard to citizens.
- CDSTARS is used regularly to advise all stations of any weather data which may require local action, such as sanding or plowing operations . In particular, this is especially useful when holidays or weekends may require recalling local work forces.
- CDSTARS is tested to all points every Tuesday morning at 9 AM except holidays.

CHAPTER FIVE

CDSTARS OVERVIEW

5.1 OVERVIEW

The most vivid appraisal of a system such as this is its acceptance by its users. Additional tasks and responsibilities for local personnel at each station at first generated a small amount of resentment. These workers have been recently barraged with new electronic alarm and surveillance systems, new communications systems, new data processing equipment; mostly brought about by the influx of federal funds through law enforcement assistant programs and new technology replacing older equipment.

Our program came along at what could be described as both good and bad timing. Good timing, in that new equipment was being installed and our equipment was just additional gear to be fitted in with the remainder. This helped in finding places for our equipment whereas previous to this time there simply wasn't any room for our equipment. On the bad timing side, the addition of yet another chore for overburdened local dispatchers seemed to be the source of resentment mentioned earlier. Complaints were heard loud and clear about these new residential alarm circuits, video cell monitoring, paging requirements, and after-hours phone coverage for others. As this new system was clearly not a law enforcement or fire radio it was received rather coldly upon initial installation.

This was anticipated however, and our installers made every effort to make small talk with these dispatchers to point out the systems possibilities. The advantages of the prototype Civil Defense State Radio System were as follows:

- It would remain quiet until an emergency occurred except for the very brief exchanges necessary during routine maintenance.
- The system would provide weather forecasts and warnings when any danger to the public safety was anticipated. This was welcomed by communities

- who previous to our program had no contact with the Weather Bureau, other than telephone. Others who subscribed to private forecasting services were delighted to hear that official government forecasts were to be provided in a timely manner over an official inter-governmental communications system. Due to the official nature of the system and its limited scope, the Weather Bureau has been willing to extend its forecasting to include the probability of sanding and/or plowing operations to help local communities prepare for such eventualities, particularly when help must be recalled after hours or for holidays or weekends.
- The mutual aid prospects between bordering cities and towns was well-received. Until this program was inaugurated, the only communications between most bordering cities and towns was by telephone.
- Also welcomed by the users was the new radio access to the various state agencies, Disaster Support Agencies and the Public Utilities that the system now provided.

The disadvantages to the CDSTARS are as follows:

- Increased work load and responsibilities for the State Civil Preparedness Agency.
- State Control is manned during only normal business hours. (After-hours by Department of Environmental Mgt.)
- Facsimile record copy capability is generally unsatisfactory due to paper longevity problems.

5.2 LESSONS LEARNED FROM THE CDSTARS PROJECT

In spite of all the planning that preceded the CDSTARS project, local officials sometimes were at a loss to identify the best place to install a CDSTARS Station. This is due to the conflict that exists when the Nuclear Hazard factor is introduced into preparedness planning. We found that the best location for the CDSTARS was where it would be appreciated. We also learned that the power of the head of the local government was sometimes necessary to affect a CDSTARS installation. This was especially true in certain Police dispatch facilities that were indeed already overburdened with equipment. We explained to local officials

that our circuit would not be busy from day-to-day and would be an adjunct to their existing circuits, but of course they had heard such stories in the past about other programs!

Local CD Directors can be very helpful in swaying negative opinions as these Directors are generally held in high regard by local officials. Our decision to have both the local CD Director and the head of local government sign these loan agreements, patterned after the program paper signature requirements, we think merits duplication.

A few local amateur radio operators indicated they were offended by this new program, feeling they were somehow being excluded. Though not true, the feelings of these volunteers was of great concern to us. Even worse however, was the loss of the volunteer restricted operators who were driven off our circuits by changes in the FCC rules and regulations. Not having control over this, our Agency was powerless. We have since provided an amateur radio repeater system which is composed entirely of amateur radio operators and is meant to provide mobile and portable communications statewide. This amateur radio system is entirely divorced from the Civil Defense State Radio System.

The minimum criteria for the loan of a CDSTARS Station be a signed loan agreement and a municipal facility in which to place the unit in, that is a site open for business daily. Every political sub-division in Rhode Island (39) was able to meet this minimum criteria. Excluded from consideration were local school buildings, which close during summer months and other vacation periods. Local communities were coaxed into giving strong consideration to police or fire facilities that were manned 24 hours a day, but exceptions were permitted when local conditions dictated. Stations were eventually placed in the following places:

- Police Dispatch facilities (23)
- Emergency Operating Centers (14)
- Civil Defense Directors Offices (11)
- City/Town Hall Offices (7)

- Fire Dispatch facilities (5)
- Public Works Garages (2)

In many cases, due to the extended local control capability that we provided at the majority of the stations, control and monitoring of the network can be from two locations. Thus the statistics represent after hours coverage, usually by police, when the main unit is unmanned.

The selective call feature of the CDSTARS facsimile circuit was originally conceived as a method to single out stations for reception of specific messages. As it turned out, this feature was very important for servicing, for if the system hadn't been designed in this way, maintenance transmissions would have disturbed the entire system wasting paper and creating unnecessary distractions statewide.

The relatively low priced equipment used in the CDSTARS Stations has proved to be very reliable. This equipment once installed, is operational 24 hours a day. Breakdowns have been minimum. A review in the breakdowns experienced follows:

- The two-way radios have been the most reliable with 5 failures in approximately one year of operation, (3 within a week of installation were covered by warranty). In these cases tampering was suspected.
- In other facilities, 1 transmitter final transistor failed and in another instance an integrated circuit in the receiver audio circuit failed. These were also covered by warranty.
- The facsimile receivers suffered about the same number of failures over the evaluation period. A defective crystal and a defective regulator transistor and solder joints were to blame for the failures.
- The facsimile printers failed approximately twice as often as the other equipment in the system, but admittedly are extremely complex electronic and mechanical devices. About half of the failures were laid to mechanical problems; bad belts, slipping clutch, interlock switch problems, stuck cassette, worn printing bars, scanner out

of synchronization, etc.

Electronic problems included:

- Defective integrated circuits and transistors
- Poor electrical contact between circuit boards and mother board cage, etc.

Adjustments of very sensitive audio levels, paper run-up (amount of waste between messages) and marking voltages which determine contrast were first set in our office by factory technicians, but later required readjustment in the field by our own technicians.

About 15 of the 60 regulated power supplies suffered pass transistor failures, mostly due to attempts to try to use these units on batteries which were not fully charged. These defective 2N3055 transistors were replaced by our technicians and a current limiting scheme using either one half ohm resistors or automotive lamps of the same resistance resolved future problems. Subsequent failures included:

- Loss of a few regulator integrated circuits (LM723)
- And a few poor solder joints

Other problems which surfaced during the evaluation:

- Three antennas were moved by high winds and had to be realigned
- New struts were fabricated to prevent future movement

At another station a workman accidentally nailed through our coaxial cable, while at another CDSTARS Station, the mating connector between two coaxial cables proved to be defective. No antenna failures were experienced, nor did any of the duplexers in the system prove troublesome.

The batteries have stood up well, 2 were overcharged when pass transistors failed and 28 volts direct current reached the battery terminals. These batteries were placed back in-service, apparently none the worse for the experience.

The principle lesson to be learned here is that in a system of this size there are bound to be technical problems. Our technicians resolved most of the problems easily and vendors warranties covered most of the costs. It goes without saying, that competent technical personnel must be in-charge of a system such as this, if it is to function after installation. Our department consists of FCC first and second class licensed personnel.

5.3 CDSTARS IN STATES OTHER THAN RHODE ISLAND

While not a problem for the state of Rhode Island and perhaps a few other small states, management of such a network statewide would pose several problems for other states which shall be covered next:

- A CDSTARS in a large state would create an enormous party-line if duplicated exactly as in our demonstration system. Our feelings are that a practical limit to the number of stations per "cell" is about 75. This figure could be adjusted lower if composed of large population political sub-divisions, higher if composed of small population communities. These cells of 75 or so communities might be controlled from county level or regional levels of sub-state government, tied back to the state emergency operating center via micro-wave or UHF multiplex channels. These channels can be separated in the EOC to represent the north zone, south zone, east zone, and west zone as a four tier example. The end result of such a system would permit any community that has a city or town hall which is open to the public daily or a manned local public safety dispatch facility, a drop on the state system which thusly would permit radio communications between these levels of government.
- In some states, the sheer number of political subdivisions appears too overwhelming to effect a manageable CDSTARS; but upon closer examination, one learns that due to sparse population and/or huge land areas, local government operations barely exist. Usually in rural towns such as these, state police usually handle law enforcement matters for example.

- In a discussion with the state of Vermont regarding a program such as CDSTARS, it was learned that while there are 246 political sub-divisions in that state, those with clearly defined active local governments which fit into the guidelines of our demonstration program number about 25. This figure closely parallels the number and location of regional school districts in Vermont (28) and tends to reflect rather accurately where CDSTARS Stations might be of value.
- Another clue to "real" requirements are regional public safety dispatching arrangements. One might reason that to closely parallel existing public safety radio dispatching systems with a CDSTARS Station might very well be another method of site selection. Using either of these selection methods in our state of Rhode Island, the number of political sub-division stations remains at 39 due to the heavy population density in this state.
- In a similar discussion with the state of New Hampshire which has some 285 political sub-divisions, it was learned that a practical CDSTARS network in that state might consist of 22 political sub-division stations plus the required supporting agency stations. 10 of these municipal stations would appear in county public safety dispatch facilities.
- In discussing a Civil Defense State Radio System with our neighboring state of Connecticut, it was learned that of the 169 municipalities that compose that state, between 130 and 140 fit the guidelines used in the CDSTARS demonstration program. Of those, Connecticut presently communicates with about half of these through 5 subordinate state offices. The remainder do not have radio communications with the sub-state offices leaving a deficiency of about 70 political sub-divisions. The Connecticut system requires that there be operators at all 5 sub-state headquarters in order for the system to function local to state.

Massachusetts with 351 political sub-divisions relies upon 4 area EOC's to establish communications with subordinate communities. These 4 area EOC's must be manned for statewide communication to function, otherwise communications is limited to that which is practical from the main Framingham facility. Of the 351 political sub-divisions in the state 117 fit the requirements of the demonstration model. If direct state to local contact is desired by the state of Massachusetts, modifications and additions to the state's existing micro-wave system would be necessary.

These brief analyses of the requirements of our neighboring states are submitted to show how the demonstration CDSTARS might fit into either an expansion of an existing system in those states or totally new systems. Existing systems in our neighboring states are essentially base-to-mobile systems with base-to-base capability, an outgrowth of each communications cell. There is a crying need for each state to have a secondary method beside telephone services to communicate with local government of reasonable size, but present FCC rules and regulations and existing systems don't even come close to satisfying the requirements here in Region One, and no doubt nationwide.

Perhaps this is due to misplaced priorities or more probably due to the mistaken impression that RACES is the solution to a state's Civil Preparedness Communications problems. The truth is that if this were true, region-to-state level communications would be via RACES and funding would be on a 50/50 basis, but the realities are that military frequencies are used to provide the radio links between the regions and the states and funding is entirely 100% Federal.

In order to create the first and only complete Civil Defense State Radio System (CDSTARS), we found that we had to go the same route, thanks to the cooperation of the Rhode Island Adjutant General Commander and the Rhode Island National Guard. Present FCC rules and regulations simply don't permit base-to base communications which is the Civil Defense Communications mission, except under RACES.

The recent notice of proposed rule making by the FCC #80-11,15465, changed the requested title from the Civil Defense Radio Service to OPERATIONS SECURE, an FCC acronym for "State Emergency Capability Using Radio Effectively". This program was supposed to respond to National dissatisfaction with present FCC rule structure and frequency allocations.

While the new proposals open up new channels on 2 to 10 MHz channels, the service requires Single-Side Band emissions, and products to serve the requirements appear only in the expensive military marketplace. The Commission has not made itself clear at this time as to whether it would permit amateur equipment to be used in this service, but even amateur gear covering these frequencies is very expensive and requires expertise to use, not to mention the antennas for these frequencies which are enormous.

Out of the 55 comments the FCC received, according to their own listing 5 originated from Rhode Island or expressed in percentage 11% of their response. Yet none of the major suggestions from our state were included in the proposed rule making therefore our comments to the Commission are still outstanding and remaining problems. Therefore a copy of our comments relative to docket RM-3059, which created the subject notice of proposed rulemaking is attached as Appendix Thirteen. It is required reading to fully understand our position regarding these CD communications problems that remain.

Our interviews of Region One State CD Communications Officers in New England can only conclude that fragmentary radio systems exist in each state and in every case the system is not RACES.

It was against overwhelming obstacles that whatever systems do exist were created through the ingenuity and aggressiveness of these state communications officers in spite of the lack of federal and state interest in the overall problem. Fellow communications officers all wondered aloud what would happen seriously if telephone services failed region wide. They also uniformly agreed that only a federally sponsored (100%) program would bring any immediate improvement in the situation. The conclusions and sentiments of the Region One Communications Officers interviewed are in total agreement with the author and will be covered in the next chapter.

5.4 RACES AND AMATEUR OPERATORS

Reliance upon amateur radio operators for a Civil Defense Radio System leaves a wide gap in activation time for short term emergencies. To rely on a system for emergency communications, whose operators would have to be called in like volunteer firemen, is obviously going to create a new problem;

how do you communicate with the volunteer operators if a communications system is lacking?

If it were possible to round-up licensed amateur radio operators instantly, such as by having them in municipal employment, the next problem is a relatively new issue, that of placing official inter-governmental communications on frequencies that are readily accessible by thousands of amateur radio operators. This is due to rather recent technology which permits keyboard frequency selection in radios which cost as little as \$200. While this new technology is a boon for establishing large groups of volunteer amateur operators who respond to calls for help, it also creates the potential for a small element of this group to "interfere" with such operations. The interference need not be deliberate, as some amateurs have taken the stance that these frequencies are theirs and that CD Communications belongs elsewhere. This does not appear to be anymore than a fragment of the rather large amateur communities opinion, but the objections were strong enough to convince the FCC to eliminate Civil Defense Volunteers who held FCC and local CD certification from the system (Volunteer enrollment card, RACES operator certificate, and FCC restricted operator permit form 753B).

Even if the FCC could be convinced to reverse itself with respect to this ruling, the use of amateur frequencies for Civil Defense Communications is still a matter of concern, for some of the objectors to non-amateurs operating have also expressed objections to Civil Defense Communications appearing on these frequencies. Also, the deportment of amateur radio operators lately has been a matter of concern during emergency operations. Any serious communications planner who acknowledges the aforementioned would be hard pressed therefore to look to RACES especially for the wide scale state to local communications mission.

In FEMA Region One for example, not a single state uses RACES for this mission. Most use the local government radio service (LGRS) which does permit use of non-amateurs as operators on frequencies not easily accessible (to transmit on) by intruders.

The uninitiated reader would presume then that the local government radio service must be the solution to the dilemma. Unfortunately, this is not true, the LGRS frequency used by the Rhode Island State Civil Defense is shared with:

- The Division of Drug Control, a Narcotics Enforcement Unit within the state Health Department.
- Various Water Departments in small nearby towns.
- Volunteer Fire Departments who use the frequency to alert volunteer firefighters to duty and for rescue call dispatching.
- Animal Control Communications (Dog Officer)
- Unidentified transmissions that sound like some sort of Public Works Operation.

Hundreds of transmissions are heard daily on the system by our switchboard operators, of which perhaps a dozen may pertain to this agency. While a continuous tone-coded squelch system (CTCSS) will soon alleviate the problem for our operators, one must still realize that the interference as outlined above, will still remain on the channel. Therefore this frequency in an emergency would probably be relatively useless.

The point of this section is to outline that the only FCC commercial service which Civil Defense Planners can turn to is the local government radio service. That also happens to be the very same service the remainder of local and state governments must use to resolve land/mobile communications requirements. In reality, LGRS is a catch-all for governments to use when other public safety services qualifications do not fit or are filled to capacity. As a result, there are literally no vacancies in or near any community of any reasonable size, and statewide vacancies are virtually non-existent in the LGRS.

Upon close examination one finds local governments frequencies also being used by various public safety elements who are entitled to use other services such as police, fire, highway maintenance, etc. This is sometimes due to there being no vacancies within the correct service, so local radio government radio service is selected as the alternative. All this might resolve a police, fire, or highway maintenance problem, but it creates a new problem for the Civil Defense community for while these public safety units might use local government radio service the frequency is thence no longer available for a local Civil Preparedness Operation. Though it might appear that public safety departments with specific FCC defined services do not belong

in local government radio service, the practice is common and widespread and the service is over populated.

This Office's desire to convince the FCC to establish a Civil Defense Radio Service was our final hope to resolve the dilemma described. When the FCC proposed that there was no need for a Civil Defense Radio Service and that what was needed was HF Single Side Band Frequencies in the local government radio service, we were shocked!

It seems odd that all public safety elements of government are fighting with one another to gain access to VHF and UHF frequencies which use readily available frequency modulated (FM) equipment while the Civil Defense community is relegated to HF, long abandoned by the public safety and more recently the Marine community with a non-existent marketplace for the equipment necessary. Certainly there can be some value to new channels being opened for Civil Defense work, but it is our opinion that the primary solutions to CD Communications problems lie in the spectrum that is least effected by skywave conditions and makes use of readily available equipment in the VHF and UHF portions of the spectrum.

It should be noted that frequencies to accomplish emergency medical services telemetry, channels for Marine "ship-to-shore and ship-to-ship" requirements, inter-city police and inter-city fire base-to-base communications, hospital-to-hospital systems have all emerged in the past ten years. Yet it still remains technically illegal by present FCC rules and regulations for a state entity to communicate with local entities within these same frequency ranges. We maintain that if it is permissible for hospitals, police, fire base stations to establish such networks to communicate with one another by radio, why not then between state and local government buildings?

CHAPTER SIX

SUMMARY, RECOMMENDATIONS AND CONCLUSIONS

6.1 SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE, SIMILAR CIVIL DEFENSE STATE RADIO SYSTEMS

If the Civil Defense Communications mission is to be taken seriously by Federal, State and Local governments, there appears to be but one solution:

- Work to establish an exclusive Civil Defense Radio Service
- Require that membership in such networks be by invitation and control of the serving state government.
- That equipment (with the exception of invited private utilities who shall purchase their own) will remain the property of state government in all cases, subject to controls and inspection by state government.
- That maintenance shall be by state government or under contract controlled by state government.
- That the system be reserved for use during bona fide emergencies, tests, and not as a method to avoid telephone tariffs.
- That mobile and portable units (excepting the state relocatable unit) not be permitted. This is where the amateur radio community comes in.
- That operator requirements be consistent with other public safety services (that is, no operator license required).
- That licensing be simplified and placed under the sub-control of state government by FCC. (A single state license for all stations within that network).
- That equipment in such a system be uniform to readily

permit exchanges of defective units and to take advantage of volume pricing for optimum cost effectiveness.

- That all stations in such a network contain automatic station identification and time-out timer technology.
- That positive voice identification be permitted by FCC in lieu of call letters, which are meaningless on a system such as this.
- That any record copy capability make use of new low cost Dot Matrix printers which operate at very high speed and do not suffer from the perishable paper problems we experienced with facsimile.(Most Dot Matrix printers will also reproduce maps nearly as well as facsimile).
- That power modules similar to what was developed for the demonstration model be used to power the system, for emergency power systems are few and far between and have a dependability problem.
- Recognize that some local governments are so widespread or so small that establishing radio communications with such governments on a daily basis is nearly impossible.

Reasonable criteria for establishing communications control points is needed with or without fallout hazard protection. Within Region One, a reasonable approach appears to be:

- That a municipal facility be manned at least daily by a paid municipal employee such as a town clerk, police tax collector, public works director, fire, etc.
- That there be at least one telephone line entering this facility paid for by local government.
- That the community be willing to accept the role it would play in being the area communications point in such a new system. (This assumes smaller governments are near this selected government).
- That this communications capability would be of paramount importance for providing local governments with important supplemental information following warnings.

- It can be assumed that such a system may well become a wireless primary warning system if developed along such lines as well as a communications system.
- That such a system may well be an extension of existing capabilities that have already been achieved by state initiative.

6.2 REQUIREMENTS - FEDERAL/STATE LEVEL

To accomplish the aforementioned will require a great deal of cooperation and interplay between the Federal, State and Local governments.

- The Federal Emergency Management Agency (FEMA) would be asked to use its influence with the Federal Communications Commission (FCC) to resolve the licensing and structural problems that have had the effect of preventing meaningful Civil Defense Communications Systems from emerging below Federal level.
- That funding for such programs be on a grant, contractual basis, similar in nature to radiological and nuclear civil protection grants which requires specific work to be done by the contractors within specific periods. Such improvements might be consistent with Federal priorities such as NCP host areas, Risk areas, and more recently with radiological emergency planning priorities.
- That the combined talents of Federal regional and state communications people might very well be necessary to work out the requirements and characteristics of each Civil Defense State Radio System. While these systems would all have the same mission, it's quite possible that no two systems would be identical in make-up.
- That at least one communications vehicle is necessary to exchange defective equipment and effect necessary technical work for such systems.

The requirement for communications equipment exchanges and calibration or alignment is nearly identical to radiological requirements. The same type of funding for maintenance and training following installation seems logical when compared to the existing RADEF program.

- That the feasibility of Regional procurement of the types of equipment necessary in the respective regions be studied. This could lead to bulk purchases which provides optimum cost effectiveness. This procurement practice might be likened to the methods which were used to procure the radiological instruments and shelter supplies presently in the State.

To summarize, it is suggested that in order to accomplish a nation-wide, effective, dependable radio communications system below federal level for Civil Defense, a program very similar to the current radiological equipment and maintenance program is necessary. Cost effective communications equipment similar in all the States, maintained in accordance with strict federal standards, is necessary if communications is to exist between governments during and following disasters, especially nuclear. The existing hodge-podge systems from state to state are not uniform, and rarely provide communications to the places necessary for establishing direction and control during emergencies. This is partly due to antiquated equipment, difficult FCC regulations, very difficult FEMA funding policies for communications, and in some cases, lack of personnel at state level.

Considering that direction and control is nearly impossible without adequate and dependable communications systems, perhaps it is time to redefine the priorities within the Emergency Management System. Recent disasters where federal and state officials had to wait in line to use pay telephones near such incidents lead one to wonder why federal and state officials allow such inept communications preparedness to exist in these modern times. Certainly the technology, equipment, and ability exists at the state and federal levels.

What is missing is the determination to create rules which permit systems such as described herein, along with a flexible but controlled funding program , followed by a contractual maintenance program to assure continued readiness and dependability.

The continued stressing of the need for plans by federal officials without working systems is an exercise in frustration for devoted State Civil Defense communicators nationally.

This office understands the frustrations of its sister states in observing communication systems in the private sector which are superior to that of government. Indeed, the public would be upset to learn that most national motel chains, car rental firms, airlines, etc., have quicker and more extensive communication systems working and in place than does the Federal Emergency Management Agency and the State's.

The lack of intra-state communications systems for Emergency Management nationwide is indeed a major flaw in the National Civil Preparedness Program.

It is hoped the work accomplished in this project will help bring this fact to light, while also helping to demonstrate how it might be accomplished and at what type of facilities.

The principle accomplishment of this project was to create a model working radio communications system and to establish reasonable criteria as to where the points of such a network might exist. The working model helped to identify the shortcomings of such a program, while demonstrating its value to the users.

Certainly, even with the operational model, CDSTARS, in Rhode Island, telephone continues to be the primary communications system, but with CDSTARS, state and federal officials are certain that dependable communications with all governments is possible even during statewide power and telephone outages. This office believes it can safely say this is unique among states and is a satisfactory conclusion to this work/study project.

AD-A100 304

RHODE ISLAND DEFENSE CIVIL PREPAREDNESS AGENCY PROVINCE F/G 17/2.1
DEVELOPMENT OF A DISTRIBUTED, ADAPTIVE, DIRECTION AND CONTROL (--ETC(U)).
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APPENDIX 1

LOCATIONS OF CIVIL DEFENSE STATE RADIO SYSTEM (CDSTARS) STATIONS

| CITY/TOWN | LOCATION |
|---------------------|-----------------------------|
| 1. BARRINGTON | TOWN HALL |
| 2. BRISTOL | TOWN HALL |
| 3. BURRILLVILLE | TOWN HIGHWAY GARAGE |
| 4. CENTRAL FALLS | EOC/FIRE HEADQUARTERS |
| 5. CHARLESTOWN | TOWN HALL/POLICE DEPARTMENT |
| 6. COVENTRY | ANTHONY FIRE STATION |
| 7. CRANSTON | FIRE STATION #2/EOC |
| 8. CUMBERLAND | BERKELY FIRE STATION |
| 9. EAST GREENWICH | EOC/POLICE DEPARTMENT |
| 10. EAST PROVIDENCE | CITY HALL |
| 11. EXETER | TOWN HALL |
| 12. FOSTER | POLICE DEPARTMENT |
| 13. GLOCESTER | TOWN HALL/POLICE DEPARTMENT |
| 14. HOPKINTON | TOWN HALL/POLICE DEPARTMENT |
| 15. JAMESTOWN | POLICE DEPARTMENT |
| 16. JOHNSTON | POLICE STATION/EOC |
| 17. LINCOLN | TOWN HALL/POLICE DEPARTMENT |

LOCATIONS OF CIVIL DEFENSE STATE RADIO SYSTEM (CDSTARS) STATIONS

| CITY/TOWN | LOCATION |
|----------------------|-----------------------------------|
| 18. LITTLE COMPTON | TOWN HALL/POLICE DEPARTMENT |
| 19. MIDDLETOWN | FIRE STATION/EOC |
| 20. NARRAGANSETT | PUBLIC SAFETY BUILDING |
| 21. NEWPORT | FIRE ALARM HEADQUARTERS |
| 22. NEW SHOREHAM | POLICE DEPARTMENT |
| 23. NORTH KINGSTOWN | EOC/POLICE DEPARTMENT |
| 24. NORTH PROVIDENCE | EOC/FIRE STATION |
| 25. NORTH SMITHFIELD | EOC/POLICE DEPARTMENT |
| 26. PAWTUCKET | DIRECTOR'S OFFICE 474 BROADWAY |
| 27. PORTSMOUTH | FIRE/EOC |
| 28. PROVIDENCE | EOC/POLICE DEPARTMENT |
| 29. RICHMOND | TOWN CLERK'S OFFICE |
| 30. SCITUATE | DIRECTOR'S OFFICE (TOWN HALL) |
| 31. SMITHFIELD | EOC/POLICE DEPARTMENT |
| 32. SOUTH KINGSTOWN | EOC/POLICE DEPARTMENT |
| 33. TIVERTON | POLICE DEPARTMENT |
| 34. WARREN | TOWN HALL/POLICE DEPARTMENT |
| 35. WARWICK | DIR'S OFF/POLICE DEPARTMENT |

LOCATIONS OF CIVIL DEFENSE STATE RADIO SYSTEM (CDSTARS) STATIONS

| CITY/TOWN | LOCATION |
|---|---|
| 36. WEST GREENWICH | TOWN HALL/POLICE DEPARTMENT |
| 37. WEST WARWICK | EOC/POLICE DEPARTMENT |
| 38. WESTERLY | ECC/POLICE DEPARTMENT |
| 39. WOONSOCKET | EOC/POLICE DEPARTMENT |
| | |
| COOPERATING STATIONS | LOCATION |
| 40. MHRH SECURITY | CRANSTON |
| 41. RI VETERANS HOME | BRISTOL |
| 42. ZAMBARANO HOSPITAL | BURRILLVILLE |
| 43. LADD SCHOOL | EXETER |
| 44. GNL. SVCS. PROP. MGMT. | 610 Mt. Pleasant Avenue Building 1, Providence |
| 45. STATE HEALTH DEPARTMENT (EMS) | 75 Davis Street Room 301, Providence |
| 46. STATE OFFICE BUILDING (DOT-DIR) | Smith Street Providence |
| 47. STATE DEPT. OF TRANSPORTATION MAINTENANCE HEADQUARTERS | 30 Arline Street Providence |
| 48. DEPT. OF ENV. MGMT. ENF. DIV. | 83 Park Street Providence |
| 49. WSBE-TV (TV EBS) CONTROL ROOM | 10 Mason Street Providence |

LOCATIONS OF CIVIL DEFENSE STATE RADIO SYSTEM (CDSTARS) STATIONS

| COOPERATING STATIONS | LOCATION |
|------------------------------------|-----------------------------------|
| 50. WEAN (CPCS-1 EBS) CONTROL ROOM | 10 Dorrance Street Providence |
| 51. URI SAFETY OFFICE | KINGSTON CAMPUS |
| 52. RI RED CROSS | 150 Waterman Street Providence |
| 53. SALVATION ARMY | 386 Broad Avenue Providence |
| 54. RI WING CAP | N. CTRL. AIRPORT Smithfield |
| 55. NATIONAL WEATHER SERVICE | T.F. Green Airport Warwick |
| 56. AIR NATIONAL GUARD | Building P-1 Quonset Airport |
| 57. ARMY NATIONAL GUARD | North Main Street Providence |
| 58. RI STATE POLICE HEADQUARTERS | SCITUATE |
| 59. BLOCK ISLAND AIRPORT | NEW SHOREHAM |
| 60. FEMA, REGION ONE | MAYNARD, MASSACHUSETTS |
| UTILITIES STATIONS | LOCATION |
| 61. NEW ENGLAND TELEPHONE | PROVIDENCE |
| 62. PROVIDENCE GAS | PROVIDENCE |

LOCATIONS OF CIVIL DEFENSE STATE RADIO SYSTEM (CDSTARS) STATIONS

| UTILITIES STATIONS | LOCATION |
|---|-------------------------|
| 63. NARRAGANSETT ELECTRIC | PROVIDENCE |
| 64. NEWPORT ELECTRIC | NEWPORT |
| 65. BLACKSTONE VALLEY ELECTRIC | LINCOLN |
| 66. VALLEY GAS | CUMBERLAND |
| 67. RIPTA (BUS SERVICES) | PROVIDENCE |
| STATE CONTROL: STATE CD HEADQUARTERS/EOC | STATE HOUSE, PROVIDENCE |

CONSULTANTS FIELD
DATA SUMMARY SHEET

Charlestown

LOCATION

10/19/78

DATE

Police Chief DeChistofaro

CONTACT PERSON

364-3811

TELEPHONE NUMBER

SAME "

DIRECTOR

TELEPHONE NUMBER NEAREST
TWO-WAY RADIO LOCATION

BASEMENT OF Police Hdqtrs Bldg.

LOCATION OF ACTUAL TWO-WAY RADIO PACKAGE

Police Dispatch Area

LOCATION OF REMOTE CONTROL UNIT*

CONSULTANTS TECHNICAL COMMENTS

Basement at Bench

120 V AC OUTLET (LOCATION)

Basement

(PRIME)

Dispatch Area

(REMOTE)

ANTENNA TEST RESULTS (ANTENNA*) S.W.R. FORWARD 20W REVERSE 0

ANTENNA CABLE LENGTH REQUIRED* None

USE EXISTING ()

REMOTE CONTROL CABLE LENGTH REQUIRED* 75'

(SUPERFICIAL ONLY)

INSTALLATION PROBLEMS, ANTENNA*: None

REMOTE CONTROL*

ADDITIONAL DATA - USE OTHER SIDE IF NECESSARY USE EXISTING 226L

Beam

NOTE: INSTALLATIONS CONSIDERED BEYOND THE SCOPE OF AN ORDINARY ONE SHALL
BE DONE LOCALLY.

TECHNICAL CONSULTANT

Richard Bramley

*IF REQUIRED

CONSULTANTS FIELD
DATA SUMMARY SHEET

LOCATION _____

DATE _____

CONTACT PERSON _____

TELEPHONE NUMBER _____

DIRECTOR _____

TELEPHONE NUMBER NEAREST
TWO-WAY RADIO LOCATION _____

LOCATION OF ACTUAL TWO-WAY RADIO PACKAGE _____

LOCATION OF REMOTE CONTROL UNIT* _____

CONSULTANTS TECHNICAL COMMENTS

120 V AC OUTLET (LOCATION) (PRIME) (REMOTE) _____

ANTENNA TEST RESULTS (ANTENNA*) S.W.R. FORWARD REVERSE _____

ANTENNA CABLE LENGTH REQUIRED* USE EXISTING () _____

REMOTE CONTROL CABLE LENGTH REQUIRED* _____

(SUPERFICIAL ONLY) _____

INSTALLATION PROBLEMS, ANTENNA: * _____

REMOTE CONTROL*

ADDITIONAL DATA - USE OTHER SIDE IF NECESSARY _____

NOTE: INSTALLATIONS CONSIDERED BEYOND THE SCOPE OF AN ORDINARY ONE SHALL
BE DONE LOCALLY.

TECHNICAL CONSULTANT

* IF REQUIRED

CDSTARS
EXTENSION & CABLE REQUIREMENTS

| CITY/ TOWN | LOCATION | ANT. REQ. | ANT. CABLE | REMOTE REQ. | REMOTE CABLE |
|---------------------|---|----------------------------|------------------|----------------|------------------|
| 1. BARRINGTON | TOWN HALL/EOC | ----- | ----- | 1 | (15.2 m) 50' |
| 2. BRISTOL | TOWN HALL | 4 EL | (30.5 m) 100' | 1 | (15.2 m) 50' |
| 3. BURRILLVILLE | TOWN HIGHWAY GARAGE | ----- | ----- | ----- | ----- |
| 4. CENTRAL FALLS | EOC POLICE/FIRE COMPLEX | ----- | ----- | 1 | (30.5 m) 100' |
| 5. CHARLESTOWN | TOWN HALL/POLICE | ----- | ----- | 1 | (30.5 m) 100' |
| 6. COVENTRY | ANTHONY FIRE STATION, RT 117 | 11 EL | (22.8 m) 75' | 1 | (15.2 m) 50' |
| 7. CRANSTON | POLICE STATION/REMOTE | ----- | ----- | 1 | (30.5 m) 100' |
| 8. CUMBERLAND | BERKLEY FIRE STATION | ----- | ----- | 1 | (30.5 m) 100' |
| 9. EAST GREENWICH | EOC/POLICE STATION | ----- | ----- | 1 | (30.5 m) 100' |
| 10. EAST PROVIDENCE | PUBLIC WORKS GARAGE 20 Bentley Street NEW CITY HALL (under constr) | (temp) offset dipole | (30.5 m) 100' | 1 | (22.8 m) 75' |
| 11. EXETER | TOWN HALL | 11 EL | (30.5 m) 100' | ----- | ----- |
| 12. FOSTER | POLICE DEPT, TOWN HALL HOWARD HILL ROAD | ----- | ----- | 1 | (15.2 m) 50' |
| 13. GLOCESTER | DIRECTOR'S OFFICE/POLICE TOWN HALL, RT 44 (CHEPACHET) | 11 EL | (15.2 m) 50' | 1 | (15.2 m) 50' |
| 14. HOPKINTON | POLICE STATION | 4 EL | (15.2 m) 50' | ----- | ----- |

CDSTARS
EXTENSION & CABLE REQUIREMENTS

| CITY/ TOWN | LOCATION | ANT. REQ. | ANT. CABLE | REMOTE REQ. | REMOTE CABLE |
|----------------------|---|------------------|------------------|----------------|------------------|
| 15. JAMESTOWN | POLICE HEADQUARTERS | 4 EL | (30.5 m) 100' | 1 | (15.2 m) 50' |
| 16. JOHNSTON | POLICE STATION/EOC | RINGO | (30.5 m) 100' | 1 | (30.5 m) 100' |
| 17. LINCOLN | TOWN HALL/POLICE STA. | ----- | ----- | 1 | (30.5 m) 100' |
| 18. LITTLE COMPTON | TOWN HALL/POLICE STA. | 11 EL | (30.5 m) 100' | 1 | (15.2 m) 50' |
| 19. MIDDLETOWN | POLICE STATION E.O.C. | ----- | ----- | 1 | (61 m) 200' |
| 20. NARRAGANSETT | DIRECTOR'S OFFICE | 11 EL | (15.2 m) 50' | 1 | |
| 21. NEWPORT | FIRE ALARM HEADQUARTERS | ----- | ----- | ----- | ----- |
| 22. NEW SHOREHAM | POLICE STATION | 11 EL | (30.5 m) 100' | | |
| 23. NORTH KINGSTOWN | E.O.C./POLICE | ----- | ----- | 1 | (30.5 m) 100' |
| 24. NORTH PROVIDENCE | E.O.C./FIRE | ----- | ----- | 1 | (30.5 m) 100' |
| 25. NORTH SMITHFIELD | TOWN HALL/E.O.C./POLICE | ----- | ----- | 1 | (15.2 m) 50' |
| 26. PAWTUCKET | DIRECTOR'S OFFICE | ----- | ----- | 1 | (30.5 m) 100' |
| 27. PORTSMOUTH | TOWN HALL/E.O.C. EAST MAIN ROAD | 4 EL | (30.5 m) 100' | 1 | (30.5 m) 100' |
| 28. PROVIDENCE | CIVIL DEFENSE OFFICE/ POLICE STATION | offset dipole | | 1 | (30.5 m) 100' |
| 29. RICHMOND | TOWN CLERKS OFFICE | 22 EL | (30.5 m) 100' | 1 | (15.2 m) 50' |
| 30. SCITUATE | TOWN HALL/ DIR. OFFICE | 4 EL | (38.1 m) 125' | 1 | (22.85 m) 75' |
| 31. SMITHFIELD | E.O.C./POLICE | ----- | ----- | 1 | (22.85 m) 75' |

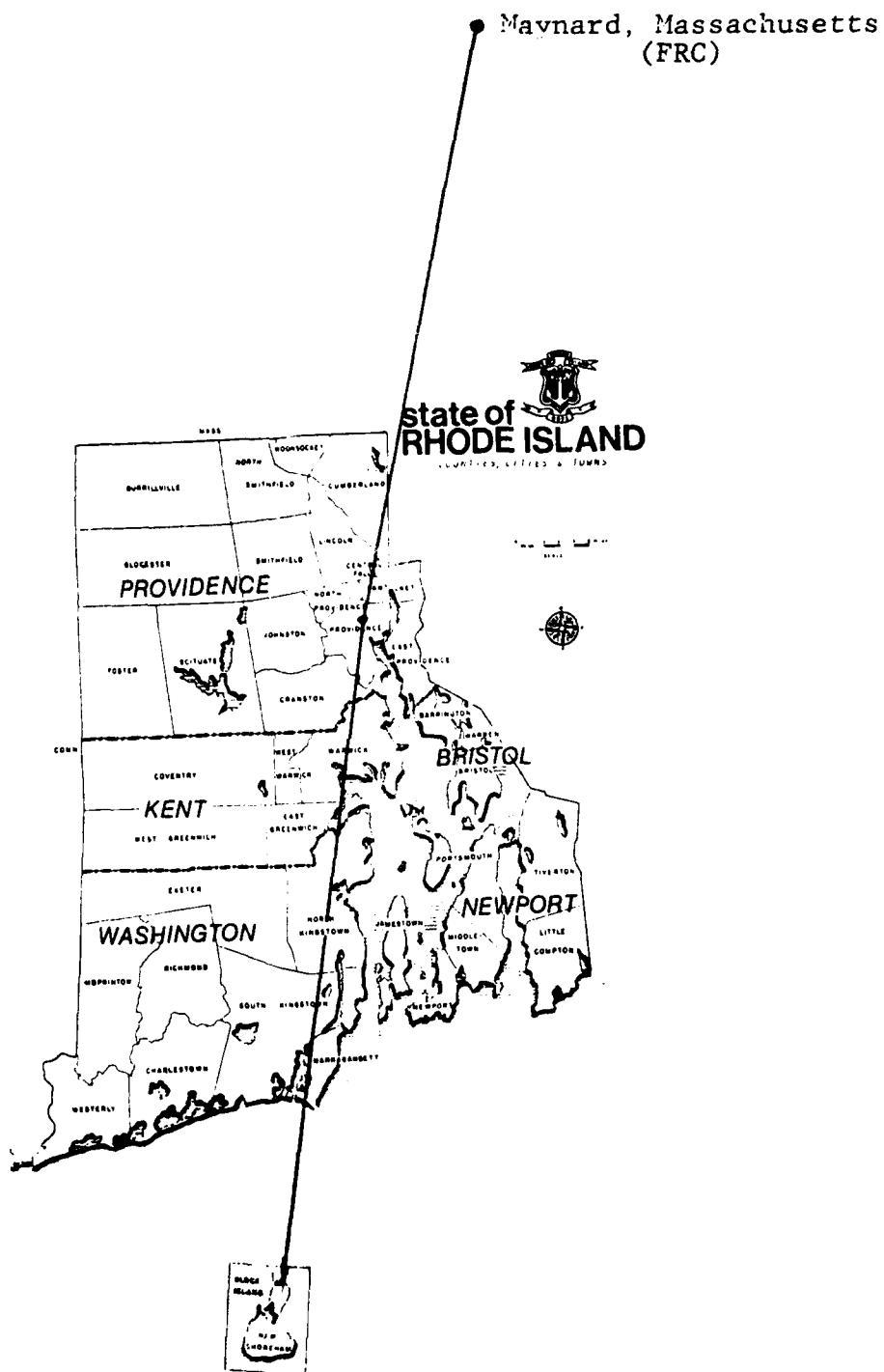
CDSTARS
EXTENSION & CABLE REQUIREMENTS

| CITY/ TOWN | LOCATION | ANT. REQ. | ANT. CABLE | REMOTE REQ. | REMOTE CABLE |
|----------------------------------|---------------------------------------|--------------|------------------|----------------|-------------------|
| 32. SOUTH KINGSTOWN | E.O.C./POLICE | ----- | ----- | 1 | (30.5 m) 100' |
| 33. TIVERTON | POLICE STATION/DIR. | 11 EL | (30.5 m) 100' | 1 | (15.2 m) 50' |
| 34. WARREN | TOWN HALL BASEMENT/POL. | ----- | ----- | 1 | |
| 35. WARWICK | POLICE STA./DIR. OFFICE | offset | (15.2 m) 50' | 1 | (30.5 m) 100' |
| 36. WEST GREENWICH | TOWN HALL/POLICE DEPT. | ----- | ----- | | |
| 37. WEST WARWICK | POLICE HDQTRS./E.O.C. | ----- | ----- | 1 | (45.73 m) 150' |
| 38. WESTERLY | POLICE HDQTRS./E.O.C. | 22 EL | (30.5 m) 100' | 1 | (30.5 m) 100' |
| 39. WOONSOCKET | POLICE HDQTRS./E.O.C. | ----- | ----- | 1 | (45.73 m) 150' |
| <u>STATE STATIONS</u> | | | | | |
| 40. R.I. MEDICAL CENTER SECURITY | CRANSTON | offset | | | |
| 41. BRISTOL VETERANS HOME | BRISTOL | ----- | ----- | ----- | ----- |
| 42. ZAMBARANO HOSPITAL | BURRILLVILLE | ----- | (30.5 m) 100' | ----- | ----- |
| 43. LADD SCHOOL | EXETER | ----- | ----- | ----- | ----- |
| 44. GEN. SVCS. PROP, MGT. | BLDG.#1 MT. PLEASANT AVE | offset | | | |
| 45. STATE HEALTH DEPT. | (EMS) PROVIDENCE | offset | (30.5 m) 100' | ----- | ----- |
| 46. STATE OFFICE BLDG. | (DOT DIRECTOR) SMITH STREET, PROV. | offset | ----- | ----- | ----- |

CDSTARS
EXTENSION & CABLE REQUIREMENTS

| CITY/ TOWN | LOCATION | ANT. REQ. | ANT. CABLE | REMOTE REQ. | REMOTE CABLE |
|---|--|----------------|--------------------------|----------------|-------------------|
| 47. STATE DOT MAINTENANCE HEADQUARTERS | OKIE ST., DISPATCH AREA | offset | (7.6 m) 25' | | |
| 48. STATE DEM ENF. UNIT | PARK ST., PROVIDENCE | RINGO | (45.73 m) 150' | ----- | ----- |
| 49. WSB E T.V. | CANAL STREET (TV EBS) | offset | (30.5 m) 100' | ----- | ----- |
| 50. WEAN | HOWARD BLDG. (RADIO EBS) PROVIDENCE | offset | | ----- | ----- |
| 51. URI | KINGSTON (HEALTH & SAFETY OFF.) | 11 EL | (30.5 m) 100' | | |
| 52. PROV. RED CROSS | WATERMAN ST., PROV. | - | - | 1 | (45.73 m) 150' |
| 53. SALVATION ARMY | 386 BROAD ST., PROV. | offset | (15.2 m) 50' | | |
| 54. R.I. WING CAP | WARWICK | offset | (30.5 m) 100' | 1 | (45.73 m) 150' |
| 55. NAT. WX. SERVICE | T.F. GREEN AIRPORT, WARWICK | YAGI OFFSET | (30.5 m) 100' 100' | 2 | (45.73 m) 150' |
| 56. AIR NATIONAL GUARD | QUONSET | - | - | 1 | (30.5 m) 100' |
| 57. NATIONAL GUARD | ARMORY OF MOUNTED COMMANDS, N. MAIN ST. | - | - | 1 | (30.5 m) 100' |
| 58. STATE POLICE HDQTRS. | SCITUATE | 11 EL | | 1 | |
| 59. BLOCK ISLAND AIRPORT | BLOCK ISLAND | 11 EL | | ----- | ----- |
| 60. FEMA REGION ONE | MAYNARD, MASS. | 22 EL | (61 m) 200' | ----- | ----- |

APPENDIX 4



CDSTARS LONGEST PATHS

19

STATE OF RHODE ISLAND
 DEFENSE CIVIL PREPAREDNESS AGENCY
 STATE HOUSE
 PROVIDENCE, RHODE ISLAND 02903

LOCAL JURISDICTIONSLOAN AGREEMENT

MIDDLETOWN

The State of Rhode Island under Federal Research and Development Contract #DCPA01-78-C-0314 is about to install a prototype Civil Defense State Radio System (CDSTARS) in Rhode Island. It will provide two-way voice communications between all local governments, other emergency response points, and State Government. Part of the system will include a facsimile "Original Document Local Reception System", so there will be no room for error or misunderstanding.

The system is being designed to be very simple to operate, i.e., similar to the Police and Fire radio networks with small space requirements.

Where an antenna and lead-in cable presently exists, for Civil Defense Communications, it will be used if satisfactory, otherwise necessary modification will be made. Agreement by signing this document extends permission necessary to install such a station at the location(s) stipulated herein.

We, the undersigned, agree that the loaned radio communications system as proposed be located as follows:

SPECIFY:

- 1) LOCATION OF TRANSCEIVER AND FACSIMILE RECEIVER PACKAGE lower level of
(Fallout Shelter, EOC,
Middletown Fire Station, Wyatt Road, Middletown, Rhode Island
Communications Center, etc.)
generator in fire station - Newport Electric Corporation
including it's power supply (provided).
- 2) LOCATION OF REMOTE CONTROL UNIT, IF NEEDED (Dispatch Area: i.e., Police/
 Fire, etc.)
Middletown Police Department (located in the same building) 24 hr. service
- 3) LOCATION OF FACSIMILE MACHINE: Primary EOC - fire station lower level
Secondary
- 4) LOCATION OF ANTENNA FOR SYSTEM
Existing Non-existing
- 5) AUTHORIZED OPERATORS: (No license required) (Job title, i.e., Police, Fire Dispatcher, Town Clerk, CD Director/Radio Officer, etc.)
Duty Police Desk - CD Director
 and any municipal employee or volunteer designated to act as operator.

We, the undersigned understand the equipment provided by the State will be loaned for use by CD - Town of Middletown
(Sub-division) for necessary communications, particularly in emergencies.

To ensure it's readiness, it is agreed that the Town of Middletown CD will
(Sub-division)

participate in tests of the system are to be checked and responded to by (See 5)
CD Director
Duty Police Desk
(Job Title).

NOTE: Equipment relocation must be requested in writing to the State Director,
Rhode Island Defense Civil Preparedness Agency, State House,
Providence 02903.

John Arruda) Local DCPA Director 18 Dec 1978 Date

Frank Amato State DCPA Director Jan 1, 1979 Date

The contents of this agreement have been read and have my concurrence as

Chief Executive of the Town/City of Middletown,

Rhode Island. James D. Gobba Dec 14 1978 Date

STATE OF RHODE ISLAND
DEFENSE CIVIL PREPAREDNESS AGENCY
STATE HOUSE
PROVIDENCE, RHODE ISLAND 02903

EMERGENCY RESPONSE AGENCY

LOAN AGREEMENT

WSBE-TV 36

The State of Rhode Island under Federal Research and Development Contract #DCPA01-78-C-0314, is about to install a prototype Civil Defense State Radio System (CDSTARS) in Rhode Island. It will provide two-way voice communications between all local governments, other emergency response points, and State Government. Part of the system will include a facsimile "Original Document Local Reception System", so there will be no room for error or misunderstanding.

The system is being designed to be very simple to operate (i.e., similar to Police and Fire radio networks) with small space requirements.

Where an antenna and lead-cable presently exists for Civil Defense Communications, it will be used if satisfactory, otherwise, necessary modification will be made. Agreement by signing this document extends permission necessary to install such a station at the location(s) stipulated herein.

We the undersigned agree that the loaned radio communications system as proposed be located as follows:

SPECIFY:

1) LOCATION OF TRANSCEIVER AND FACSIMILE RECEIVER PACKAGE

(Fallout Shelter, EOC,

WSBE-TV, MASTER CONTROL ROOM 1-24 MASON ST. PROV.
Communications Center, etc.

including it's power supply (provided).

2) LOCATION OF REMOTE CONTROL UNIT, IF NEEDED (Specify exactly) D. No A.

3) LOCATION OF FACSIMILE MACHINE: Primary Location (1) MASTER CONTROL RM.

Secondary Location (2) _____

4) LOCATION OF ANTENNA FOR SYSTEM

Existing _____ Non-existing 5TH FLOOR ROOFTOP
24 MASON ST. PROV. R.I.

5) AUTHORIZED OPERATORS (No license required)(Specify by Job Title)

E.C.C. LICENSED TECHNICANS & ENGINEERS

and any employee or volunteer designated to act as operator.

We, the undersigned, understand the equipment provided by the State will be
loaned for use by ~~R.I. DEFENSE CIVIL PREPAREDNESS AGENCY~~
~~PUBLIC TELEVISION WSBE-TV~~
(Name of emergency response Agency)

for necessary communications, particularly, in emergencies.

To ensure it's readiness, it is agreed that WSBE-TV will
(Agency)

participate in tests and report to the State DCPA Agency any system failures.

Weekly tests of the system are to be checked and responded to by (See 5)

ASST. DIR. OF ENGINEERING
(For Title)

NOTE: Equipment relocation must be requested in writing to the State Director,
Rhode Island Defense Civil Preparedness Agency, State House,
Providence.

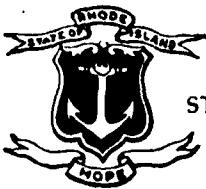
Warren A. Kraetz

Director JAN. 12, 1979 Date

Santo Tomas

State DCPA Director _____ Date

JAN. 15 1979



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

DEFENSE CIVIL PREPAREDNESS AGENCY
State House
Providence, R. I. 02903

January 8, 1979

Manager
WSBE TV Channel 36
24 Mason Street
Providence, Rhode Island 02903

ATTENTION: MR. THOMAS PRYOR

Dear Mr. Pryor:

The enclosed Loan Agreement is being returned for the following reason(s):

- Local Director's signature required.
- Concurrence of the Chief Executive of your community required.
- Concurrence of the Director of your emergency response agency required.
- Document is signed by all parties, has the concurrence of this office, and a copy of this Agreement is being returned for your files.
- Other

A fact sheet about the new Civil Defense State Radio System (CDSTARS) is enclosed to assist you in briefing your local Chief Executive about the new system.

It is not possible to predict delivery dates for all components of the system at this time due to the magnitude of the project, but this office expects installations to begin in less than three months.

Sincerely,

A handwritten signature in cursive ink that appears to read "Santo Amato".

Santo Amato
Director

TECHNICAL RADIO SPECIFICATIONS - CIVIL DEFENSE STATE RADIO SYSTEM (CDSTARS)

GENERAL:

Due to the duplex requirements of the Civil Defense State Radio System (CDSTARS) two-way radios must be constructed with special consideration to confinement of spurious radiation, (metal cabinets), front end selectivity, (as with helical type resonators), and performance characteristics lending themselves to the type of operation required in the network. To prevent accidental or deliberate jamming of the simplex voice frequency (** MHz), there must be factory provision for the installation of a time-out-timer. Funding limitations preclude our requesting bids with such time-out-timers (T.O.T.) installed. The State, therefore, reserves the option to install it's own T.O.T.'s or to enter into a subsequent order for "plug-in" T.O.T. modules, should additional funding become available. Bids should clearly indicate cost of T.O.T.'s. In either case, such installation and other routine deviation and frequency netting actions by State Technicians shall not be considered voiding of warantees. Vendors submitting bids on this system hereby agree to the variances of warantee, so stipulated. The following manufacturers have submitted evaluation units to the State Agency for duplex testing: Genave, General Electric, Aerotron and Standard. Other manufacturers are welcome to bid, but final award will be reserved until a working on frequency, production sample, is supplied and tested by Stat: Agency personnel to assure operation in the duplex mode, (CONFIDENTIAL: Voice channel ** MHz-facsimile receive ** MHz). A mobile type duplexer will be a component in every station. (Phelps Dodge #636A, or equivalent, to be acquired by the State in a separate bid.)

** Operating frequencies deleted.

The State has already purchased extended LOCAL CONTROL units (SSC Model 893-5), to allow operation of the radios from a secondary location. Although only forty of the network stations will exercise this option, all radios per equipment requirements schedule, shall be delivered so that such extended LOCAL CONTROL appears on the outside rear apron of the radio. Required is: (1) Audio Output; (2) P.T.T; (3) Ground; (4) B+; (5) B-; (6) AUDIO INPUT. Radios shall be furnished with mating connectors to accomplish , i.e.: (Molex male and female 10 PIN, or similar plugs.) All two-way radios shall be equipped with detachable dynamic microphones (plug in). All radios shall be delivered to the:

STATE OF RHODE ISLAND
DEFENSE CIVIL PREPAREDNESS AGENCY
STATE HOUSE
PROVIDENCE, RHODE ISLAND 02903
(Shipping Entrance - Smith Street.)
(Mondays - all day. Tuesday thru Friday - 8:30 AM until 11:00 AM, only.)

All radios supplied shall be provided with transmit and receive crystals. Such crystals shall be waranteed to remain within such specifications for the lifetime of the system.

All two-way radios shall be factory waranteed, parts and labor, to be free from defects for A PERIOD OF ONE YEAR, FROM DATE OF DELIVERY

Several private companies, with Civil Defense ties, have expressed an interest in joining the network we are creating with this purchase. Vendors bidding this system hereby agree to allow SINGLE RADIO purchases at the bid price by the individual firms, stipulated by the Rhode Island Defense Civil Preparedness Agency. Such firms will pay direct to the winning bidder the actual cost of it's radio: Delivery will in all cases be to the State Agency. The State Agency currently has letters of intent from the following: Narragansett Electric Company; Providence Gas Company; Newport Electric Company and the New England Telephone Company. There could be additional firms, not to exceed ten, that may wish to purchase such radios direct. Please allow for such latitude in your proposal to the State.

EQUIPMENT REQUIREMENTS:

62 - 148-MHz, VHF-FM Two-Way Mobile type (to be used as Base Stations) FACTORY-TUNED" with crystals to transceive on ** MHz, with rear apron extended remote provisions and time-out-timer, plug in option, microphone and cabinet mounting brackets included.

4 to 10 - As above, to be shipped with above, but billed separately to the firms identified by the State.

2 - ** MHz, VHF-FM two-way mobile type to be "FACTORY TUNED" to . ** MHz with rear apron extended remote provisions.

2 - UHF two-way mobile type to be "FACTORY-TUNED", to ** MHz, with rear apron extended remote provisions per specifications.

2 - VHF two-way mobile type to be "FACTORY TUNED" to _____ MHz. (Federal Region One Link.) ** Operating frequencies deleted

OPTION:

60 - Plug in, time-out-timers to be purchased (should funding permit), and installed by the State Agency \$_____. No mobile antennas are required for this system.

It is the intent of these specifications to provide reliable, high quality communications equipment to assure many years of satisfactory service. All units from microphone to antenna connector must function in a proper and satisfactory manner.

These specifications are prepared with the express intent of obtaining the best equipment serving the interest and needs of the State of Rhode Island Defense Civil Preparedness Agency (DCPA). Alternate proposals will not be accepted or considered. The specifications herein are not in any way to be deemed restrictive as to intent or application; but is the purpose to draw out within the respective bids the specific types as to quality and quantity being offered. Bids shall be considered only from those concerns who are presently engaged in the design and manufacture of two-way radio equipment. Criteria for the equipment shall be to fulfill the State's requirements for the procurement of single frequency (simplex) transceivers operating in the VHF (148 MHz) band.

All equipment shall be new, free of corrosion, scratches or other defects as to present other than a new appearance. The radio sets shall be solid state design and shall be of the bidders own design and manufacture to fix responsibility with the bidder and to assure equipment integrity. The contractor shall be prepared to demonstrate to the satisfaction of the State of Rhode Island's Communications and Warning Officer that the quipment meets all specifications, prior to award.

WARRANTY:

All equipment shall carry a guarantee, including labor, for a period of one (1) year from date of acceptance against defects in design, material and workmanship. Crystals shall be warranted for the life of the radio.

RADIO SETS:

The radio sets shall be fully transistorized (or integrated circuits) design or a combination thereof. Fullest weight shall be given to low current drain, ruggedness and low maintenance requirements. The units shall be equipped with a carrier squelch system.

External front panel controls shall be restricted to the following:

- 2 -

1. Volume,
2. Squelch (may be pre-set),
3. Any frequency switches shall be rendered inoperative by the vendor.

Volume control design shall be such that, at minimum setting, no less than 10% of rated audio output shall be available. The units ON/OFF capability (switch) shall be rendered inoperative in the "ON" condition or replaced with volume only control, in those cases where practical.

External rear panel controls/connections shall be of the following:

1. Antenna port (SO 239, or equivalent);
2. DC connection (coded red (+) black (-) cable appropriately fused, (included) with wire leads;
3. A minimum of six (6) pin female accessory connector "FACTORY-WIRED" as follows:
 - a. "A" voltage (i.e., 13.8 (VDC));
 - b. Microphone Hi. (To accept pre-amplified dynamic microphone from remote unit)
 - c. Speaker Hi. (Low Z audio out);
 - d. Common (ground);
 - e. Push to Talk (PTT).

Radio set microphone element to be OUT OF CIRCUIT when in receive mode.

TECHNICAL SPECIFICATIONS:

In all details not specifically stated herein, it is understood that the equipment shall meet or exceed those requirements of the Electronics Industries Association (EIA) and the Federal Communications Commission (FCC) which are current at the time of the bid award.

DELIVERY:

The State of Rhode Island DCPA will accept delivery of equipment that is shipped Free on Board (F.O.B.) point of shipment only, and the bidder shall be responsible for filing any claims against the carrier. The equipment shall be delivered no later than thirteen weeks after receipt of order, but as soon as practical.

ELECTRICAL SPECIFICATIONS:

The radio set shall be a compact, rugged lightweight unit consisting of a transmitter-receiver assembly in a fully enclosed metal housing. Transistor and integrated circuitry shall be used throughout the transmitter and receiver in keeping with good engineering practice. No tubes shall be used.

RECEIVER:

| | |
|---|---|
| SENSITIVITY: | .35 uv for 12 db SINAD - less than .5 uv for 20 db of quieting. |
| SELECTIVITY: | Plus/Minus 7.5 kHz. |
| SQUELCH SENSITIVITY: | .3 uv, less than |
| ADJACENT CHANNEL REJECTION: | 40 db minimum, @ \pm 25 kHz: (EIA 55 db for 20 db quieting.). |
| INTERMOD RESPONSE: | 60 db minimum (EIA). |
| IMAGE RESPONSE: | 60 db minimum (EIA). |
| SPURIOUS RESPONSE: | 65 db minimum (EIA). |
| AUDIO OUTPUT: | 3 W minimum @10% distortion. |
| HUM AND NOISE: | Better than 35 db below rated output. |
| One stage of RF pre-amplification ahead of mixer, minimum of two tuned Helical resonators to provide required RF front end selectivity. | |
| FREQUENCY STABILITY: | .001% (-30 to +60 degrees C). |

TRANSMITTER:

| | |
|-------------------------|-----------------------------------|
| POWER OUTPUT: (Minimum) | 20 Watts into 50 ohm termination. |
| DEVIATION: | + 5 kHz maximum (16F3). |
| FREQUENCY STABILITY: | 0.0005% (-30C to +60C). |
| SPURIOUS: | -65 db minimum. |
| HARMONICS: | -56 db minimum. |
| FM NOISE: | -40 db. |

A time-out timer (TOT) shall be available as a plug in option in the units to automatically turn off the transmitter in the event same is inadvertently keyed for an extended period of time. This item shall be adjustable internally from 1 to 3 minutes. The timer shall automatically reset when the transmit condition is removed.

APPENDIX 8

CDSTARS CHECK LISTFOR Exeter

Serial numbers of duplexer, 2 way radio, and FAX receiver and printer
1523 duplexer .188 2 way RI 37 receiver 20034 printer
 State property number 353897 / / SN of EX RMT (if applicable) N/A

Telephone numbers of phones near the CDSTARS 294 3891,
 _____, _____, _____.

Exact address of this facility Exeter town hall, Victory Hwy
Exeter, RI Zip code 02822.

SWR forward power 17 Reflected power 0

Battery reading 13.5 Volts.

Antenna type 11 El Yagi.

Leave complete list of stations - explain categories and weekly tests.
 FAX paper availability and cost.

Is the set grounded?

Is pulse protection in place?

Any problems? Fax rev system intermittent.

Demonstrate how to change FAX paper. Leave extra roll.
 (Cartridge holder).

Determine who answers test - show how to mute RMT.

Show users the battery status indicators (red and yellow).

Emphasize Emergency Communications Network--not meant to replace telephone!!!!

Loan Agreement on file? Y

Operating instructions at unit. N/Fax paper change only

FAX tested O.K. (see above)

2 way tested O. K. Y

R. Bromley
Installer9/25/79
Date



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
OFFICE OF THE ADJUTANT GENERAL
ARMORY OF MOUNTED COMMANDS
1051 NORTH MAIN STREET
PROVIDENCE, R. I. 02904

TAGRI-AG

18 May 1980

Mr. Santo Amato, Director
Defense Civil Preparedness Agency
State House
Providence, Rhode Island 02903

Dear Mr. Amato:

Reference is made to your letter of April 1979 requesting my office to assist you in establishing a mutual aid radio network for state emergencies.

Our technical specialists have worked out the necessary details locally and with appropriate military authorities out of State. Enclosed is the Shared Radio Frequency authorization issued to The Adjutant General of Rhode Island.

I am pleased that we have been able to assist in this cooperative project which will benefit both of our agencies in dealing with disasters and other emergency situations, especially when telephone service is heavily overloaded or interrupted.

I understand that during testing and evaluation the system has already proven its usefulness. This cooperative effort between our two agencies may prove useful in saving lives in times of emergency and in promptly deploying our resources where and when needed.

I am also aware that your communications personnel will test and maintain the system to insure operational readiness.

Looking forward to future mutual endeavors, I am

Sincerely,

A handwritten signature in black ink, appearing to read "Leonard Holland".

LEONARD HOLLAND
Major General
Commanding

DEPARTMENT OF THE ARMY
OFFICE OF THE ARMY FREQUENCY COORDINATOR - EASTERN UNITED STATES
UNITED STATES ARMY COMMUNICATIONS COMMAND (USACC)
FT GEORGE G. MEADE, MARYLAND 20755

RADIO FREQUENCY AUTHORIZATION

| AUTHORIZATION TO: | | | THE ADJUTANT GENERAL STATE OF RHODE ISLAND 1051 N. MAIN STREET PROVIDENCE, RI 02904 | CALL SIGN AR 105-24 See AR 105-64 |
|---|------------------|----------|--|---|
| ISSUED TO: Defense Civil Preparedness Agency State House, Providence, R. I. 02903 ATTN: Mr. Santo Amato, Director | | | DATE 17 May 1980 | |
| FREQUENCIES (All MHZ) | MAXIMUM POWER | EMISSION | RECEIVING POINTS | TYPE OF SERVICE |
| * Frequencies deleted | | | | |
| * MHZ (AR751286) | 100W | 16.00F3 | " " | TACTICAL TRAINING ML |
| * MHZ (AR801058) | 100W | 16.00F3 | " " | Disaster and mutual aid service |
| * MHZ (AR801059) | 100W | 16.00F3 | " " | |

CONDITIONS OF ASSIGNMENT

1. Operation must conform to the regulations applying to the class of service indicated.
2. Minimum power consistent with adequate service should be used at all time.
3. All assignments are made on a noninterference basis.
4. Frequencies shown above may (may not X) be used for convoy control throughout First Army area without further clearance.

EXPIRATION DATE: 30 April 1985

The NET Control Station (only) will use the administrative CALL SIGN AAB500.
All other stations will use (PVI)
Positive Voice Identification or
suffixes thereof.

Ralph Corbeardo
CWO RALPH CORBEARDO, JR.
Local Frequency Manager
Rhode Island National Guard

APPENDIX 10

STATE OF RHODE ISLAND
DEFENSE CIVIL PREPAREDNESS AGENCY
STATE HOUSE
PROVIDENCE, RHODE ISLAND 02903

February 1, 1977

COMMUNICATIONS AND WARNING MEMORANDUM NO. 77-1

TO: All local Directors and Radio Officers
FROM: State Defense Civil Preparedness Agency Director
SUBJECT: ANNUAL LOG EXTRACT FROM STATE RACES LOG, FOR THE YEAR 1976

Listed below are the actual number of contracts as recorded in the State RACES radio log between the Rhode Island State DCPA EMERGENCY OPERATING CENTER and the points as listed:

| | | | |
|------------------|----|-----------------|----|
| Woonsocket | 70 | Lincoln | 15 |
| Central Falls | 69 | Johnston | 14 |
| Little Compton | 66 | Providence | 12 |
| Glocester | 58 | Coventry | 12 |
| North Kingstown | 50 | Foster | 11 |
| Scituate | 43 | Bristol | 10 |
| Newport | 31 | Cranston | 05 |
| East Greenwich | 27 | Middletown | 04 |
| North Providence | 23 | Narragansett | 04 |
| Barrington | 21 | Pawtucket | 03 |
| Smithfield | 21 | Cumberland | 02 |
| Warwick | 19 | New Shoreham | 02 |
| North Smithfield | 18 | East Providence | 01 |
| Warren | 13 | Richmond | 01 |

Other stations contacting the State DCPA headquarters during the past year included:

| | |
|---|----|
| Narragansett Electric, Providence | 42 |
| Newport Chapter, Red Cross | 27 |
| Providence Gas Company | 24 |
| Providence Chapter, Red Cross | 24 |
| State Department of Health, E. M. S. | 24 |
| Central Rhode Island Red Cross, Warwick | 23 |
| Rhode Island Air National Guard, Theodore Francis Green Airport | 22 |
| O'Rourke Children's Center, State of Rhode Island | 20 |
| United States Air Force, Civil Air Patrol | 19 |
| State Department of Transportation | 10 |
| Blackstone Valley Electric Company, Lincoln | 05 |
| Civil Air Patrol Wing, North Central Airport | 03 |
| Zambarano State Hospital, Burrillville | 01 |

[Signature]
Major General Leonard Holland
The Adjutant General
Director

RAB:mma

APPENDIX 11

STATE OF RHODE ISLAND
DEFENSE CIVIL PREPAREDNESS AGENCY
STATE HOUSE
PROVIDENCE, RHODE ISLAND 02903

TO: CDSTARS STATIONS
"FROM:" STATE DIRECTOR
SUBJECT: PAPER FOR CDSTARS FACSIMILE MACHINE

To save gasoline, we are mailing you a re-fill roll of paper for your CDSTARS facsimile machine. Please DO NOT change paper until printing is so light that it is unreadable, as premature paper changing simply wastes this paper which now costs \$10.00 per roll. We have been allocated one additional new roll of paper for each machine, and with our recycling program, this should take us into 1981. It would be appreciated if you could or would pick up subject paper to expedite situation.

When changing the roll of paper, please be patient and make certain the cassette (which helps extend the life of the paper) is perfectly closed before trying to replace it in the machine. You can assure keeping the cassette from opening in the machine by placing a small piece of tape on the side to prevent it from opening during installation. Please follow enclosed detailed instructions for loading paper.

When this new and final lot of facsimile paper is depleted, this office will no longer be in a position to provide replacement rolls. As was announced at the beginning of this program, paper procurement will then become the responsibility of each station. We have arranged with the Stewart-Warner Datafax Corporation to honor individual purchase orders from each station. Please take note of the Blue Streak or drying of paper which makes reading the copy difficult. Either of these signals indicates new paper is necessary soon! A phone call to Stewart-Warner in New Jersey at 201-351-2712 with a purchase order number will get a roll in the mail to you or by letter, order to Stewart-Warner, 67 Prince Street, Elizabeth, New Jersey 07208.

(30.5 m)
The part number of a 100 foot of paper is #01P230399-21-11. The present price is \$9.49 per roll plus shipping. As the paper has a limited shelf life, this office suggests buying on an as needed basis. DO NOT STOCKPILE more than one extra roll...as the shelf life of this paper is but three months.

This office will still be responsible for servicing, testing and trouble shooting the remainder of the system...for service, call the State DCPA Communications at 421-7333.


Santo Amato

RAB:bmp

A check mark here indicates this is your stations final "FREE" roll.

APPENDIX 12

52 WEEKS LOG SUMMARY *

CDSTARS TEST RESULTS

| CDSTARS CITY/TOWN | 2 WAY TEST | FAX TEST | F A X T E S T | |
|----------------------|---------------|-------------|---------------|--------|
| | | | SAT. | UNSAT. |
| 1. BARRINGTON | 50 | 50 | 46 | 4 |
| 2. BRISTOL | 29 | 29 | 20 | 9 |
| 3. BURRILLVILLE | 52 | 52 | 43 | 9 |
| 4. CENTRAL FALLS | 52 | 52 | 41 | 11 |
| 5. CHARLESTOWN | 35 | 35 | 26 | 9 |
| 6. COVENTRY | 46 | 46 | 39 | 7 |
| 7. CRANSTON | 45 | 45 | 29 | 16 |
| 8. CUMBERLAND | 50 | 50 | 39 | 11 |
| 9. EAST GREENWICH | 17 | 17 | 14 | 3 |
| 10. EAST PROVIDENCE | 37 | 37 | 25 | 12 |
| 11. EXETER | 41 | 41 | 25 | 16 |
| 2. FOSTER | 40 | 40 | 28 | 12 |
| 3. GLOCESTER | 42 | 42 | 4 | 38 |
| 14. HOPKINTON | 24 | 24 | 13 | 11 |
| 15. JAMESTOWN | 43 | 43 | 30 | 13 |
| 6. JOHNSTON | 51 | 51 | 40 | 11 |
| 7. LINCOLN | 41 | 41 | 21 | 20 |
| 18. LITTLE COMPTON | 51 | 51 | 44 | 7 |

52 WEEK LOG SUMMARY *

CDSTARS TEST RESULTS

| CDSTARS CITY/TOWN | 2 WAY TEST | FAX TEST | F A X T E S T | | |
|----------------------|---------------|-------------|---------------|----|--------|
| | | | SAT. | | UNSAT. |
| 19. MIDDLETOWN | 42 | 42 | | 33 | 9 |
| 20. NARRAGANSETT | 51 | 51 | | 40 | 11 |
| 21. NEWPORT | 51 | 51 | | 26 | 25 |
| 22. NORTH KINGSTOWN | 42 | 42 | | 32 | 10 |
| 23. NORTH PROVIDENCE | 52 | 52 | | 35 | 17 |
| 24. NORTH SMITHFIELD | 38 | 38 | | 15 | 23 |
| 25. PAWTUCKET | 43 | 43 | | 31 | 12 |
| 26. PORTSMOUTH | 13 | 13 | | 9 | 4 |
| 27. PROVIDENCE | 46 | 46 | | 33 | 13 |
| 28. RICHMOND | 24 | 24 | | 16 | 8 |
| 29. SCITUATE | 52 | 52 | | 46 | 6 |
| 30. SMITHFIELD | 12 | 12 | | 8 | 4 |
| 31. SOUTH KINGSTOWN | 14 | 14 | | 3 | 11 |
| 32. TIVERTON | 49 | 49 | | 38 | 11 |
| 33. WARREN | 48 | 48 | | 30 | 18 |
| 34. WARWICK | 49 | 49 | | 34 | 15 |
| 35. WEST GREENWICH | 52 | 52 | | 43 | 9 |
| 36. WEST WARWICK | 45 | 45 | 36 | | 9 |

52 WEEK LOG SUMMARY *

CDSTARS TEST RESULTS

| CDSTARS CITY/TOWN (Placement) | 2 WAY TEST | FAX TEST | F A X T E S T | |
|--------------------------------------|---------------|-------------|---------------|--------|
| | | | SAT. | UNSAT. |
| 37. WESTERLY | 2 | 2 | 2 | 0 |
| 38. WOONSOCKET | 47 | 47 | 33 | 14 |
| 39. RI MEDICAL SEC. CENTER | 40 | 40 | 31 | 9 |
| 40. RI VETERAN'S HOME | 40 | 40 | 31 | 9 |
| 41. ZAMBARANO HOSPITAL | 37 | 37 | 17 | 20 |
| S42. LADD SCHOOL | 6 | N.I.** | N.I.** | N.I.** |
| S43. GEN. SVC. PROP. MGT. | 48 | 48 | 35 | 13 |
| 44. STATE HEALTH DEPT(EMS) | 36 | 36 | 27 | 9 |
| 45. STATE OFFICE BLDG. (DOT-DIR) | 48 | 48 | 43 | 5 |
| 46. STATE DOT MNTNCE. HDQTRS. | 21 | 21 | 11 | 10 |
| 47. DEPT. ENV. MNGMNT., ENF. DIV. | 49 | 49 | 41 | 8 |
| 48. WSBE-TV (TV-EBS) | 52 | 52 | 37 | 15 |
| 049. WEAN, CPC-1, EBS | N.I.** | N.I.** | N.I.** | N.I.** |
| S50. URI-KINGSTON CAMPUS | 26 | 26 | 19 | 7 |
| 51. R.I. RED CROSS | 41 | 41 | 28 | 13 |
| 52. SALVATION ARMY | 42 | 42 | 31 | 11 |
| 053. R.I. WING CAP(N. CTRL) | 52 | 52 | 42 | 10 |

52 WEEK LOG SUMMARY *

CDSTARS TEST RESULTS

| CDSTARS LOCATION | 2 WAY TEST | FAX TEST | F A X T E S T | |
|------------------------------------|---------------|-------------|---------------|--------|
| | | | SAT. | UNSAT. |
| F54. NATIONAL WEATHER SRVC. | 39 | 39 | 29 | 10 |
| S55. AIR NATIONAL GUARD | 39 | 39 | 26 | 13 |
| S56. ARMY NATIONAL GUARD | 43 | 43 | 27 | 16 |
| S57. RI STATE POLICE HDQTR. | 46 | 46 | 37 | 9 |
| S58. BLOCK ISLAND AIRPORT | 43 | N.I.** | N.I.** | N.I.** |
| F59. FEMA REGION ONE | 10 | N.I.** | N.I.** | N.I.** |
| <u>UTILITIES STATIONS</u> | | | | |
| U60. NEW ENGLAND TELEPHONE | 43 | 43 | 21 | 21 |
| U61. PROVIDENCE GAS CO. | 28 | None | None | None |
| U62. NARRAGANSETT ELECTRIC | 39 | None | None | None |
| U63. NEWPORT ELECTRIC | 38 | None | None | None |
| U64. BLACKSTONE VALLEY ELECTRIC | 27 | None | None | None |
| U65. VALLEY GAS | 23 | None | None | None |
| J66. RIPTA (BUS SERVICE) | 41 | 41 | 29 | 12 |

* No fax testing was done on August 8th or on August 19th, 1980.

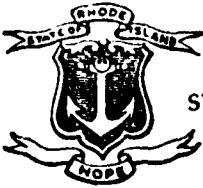
** N.I. - To be installed upon conclusion of total system evaluation.

F Federal

S State

U Utility Station

APPENDIX 13



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

DEFENSE CIVIL PREPAREDNESS AGENCY
State House
Providence, R. I. 02903

March 22, 1978

Federal Communications Commission
Washington, D. C. 20554

STATE OF RHODE ISLAND: COMMENTS RELATIVE TO DOCKET RM-3059

The State of Rhode Island Defense Civil Preparedness Agency supports the principles of DOCKET RM-3059 to establish a civil preparedness radio service. This agency has long advocated that while the Radio Amateur Civil Emergency Service (RACES) has its place in backing up emergency communications, primary systems such as Police, Fire, and Highway Maintenance systems should be on commercial frequencies. Using this same reasoning, civil preparedness communications should also be on similar frequencies and restrictions against base to base station communications removed, so that heads of local governments and state government can communicate with each other during emergencies. This restriction has been waived in the Police and Fire Radio Services on so called inter-city frequencies and should be extended to the civil preparedness radio service as well.

During the Blizzard of '78, it was especially noted that special orders being put into effect by the Governor were not received by local communities due to difficulties with telephone systems being overloaded and unworkable. Amateur radio systems were unmanned due to amateurs being unable to reach their operating positions due to the snow situation. This is just as we predicted might happen in previous comments to the Commission, though a blizzard was not the situation envisioned. It was inappropriate for the heads of local government to receive vital information from the Governor via the news media rather than an official inter-government communications system. The so-called local government service does not fit this mission with its land-mobile restrictions and the unavailability of channels.

While certain states may desire the civil preparedness radio service to use lower frequencies due to large state size, there remains a persistent need for VHF frequencies for use at or near disaster sites with tolerant rules to allow for simple portable equipment to be brought into place to establish needed communications during disasters which based upon the current marketplace and technology would best be in the 152-174 MHz region of the spectrum. Federal authorities continue to be hampered by the inability to net with state authorities and local authorities at disaster sites. Therefore in acting upon this docket, this state asks the Commission to address itself

to the problem of federal, state and local authorities working together at disaster scenes all with different operational frequencies and equipment and assist in solving this recurring problem. Special rules permitting such operation and waivers will be necessary, but are vitally needed, to assist these authorities in carrying out their work.

Therefore, this state endorses the DOCKET RM-3059 and asks the Commission to extend itself into solving issues not specifically addressed in the petition; that is allocation of specific national and regional response frequencies for VHF civil preparedness communication, the waiver of base to base station restrictions such as has been allowed for inter-city police and fire, the licensing of portable base stations to state, federal and perhaps local civil defense units for the purpose of being brought to disaster sites, the elimination of operator license requirements, and simple, sensible licensing arrangements within each state with coordination being directly assigned to the State Civil Preparedness Agency within each state for the frequencies finally selected for the service. To even further simplify this system, a blanket license might be given to each state covering all subordinate units within each state eliminating tons of paperwork for the Commission and placing the operation and control of such networks directly at the state level. Subordinate units might be identified by subdivision title as is commonplace on inter-city police and fire channels and one collective call sign be used for the entire network within each state.

Enclosed are selected memos and exhibits prepared by this office prior to the petition now before the Commission on this same subject which may assist the Commission in drawing conclusions on the subject.

Sincerely,



Santo Amato
Director



Richard A. Bouchard
Communications and Warning Officer

RAB:bmp

Enclosures

STATE OF RHODE ISLAND
DEFENSE CIVIL PREPAREDNESS AGENCY
STATE HOUSE
PROVIDENCE, RHODE ISLAND 02903

March 10, 1978

COMMUNICATIONS AND WARNING MEMORANDUM 78-5

TO: Local Directors and Radio Officers
FROM: State Director
SUBJECT: FCC CIVIL PREPAREDNESS RADIO SERVICE DOCKET

A petition has been filed with the Federal Communications Commission (FCC) to establish a Civil Preparedness Radio Service and has been allocated file number RM-3059. This docket is now ready for public comment which must be made directly to the FCC, Washington, D. C. 20554. Please label your comments RE: Docket RM-3059.

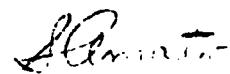
This office suggests your comments contain reference to the present amateur status of Civil Preparedness Communications, (RACES), and hopefully will encourage the Commission to react favorably toward at least the "concept" of this petition. As it now stands, it is unlawful, and impractical for Federal, State, and local officials to establish radio communications with one another from Emergency Operating Centers (EOC'S) except via the Radio Amateur Civil Emergency Service (RACES). In that such communications must be done by licensed amateurs under the latest rules, this is impractical in many instances.

Listed below are excerpts from the petition:

"Establish a Civil Preparedness Radio Service within Part 89 of the FCC rules... needed to assure effective assistance in civil disasters and emergencies.... need for planned, tested and effective communications...inadequate, untested patchwork radio systems (in use now)...communications most needed are VHF-line of sight-for mobile and portable operation...(references are made in the petition to recent disasters)...conclusion "that a State Agency...cannot perform its functions to maximum effectiveness with the radio frequency resources available in the (present) FCC rules"...Local/State government frequencies may not be primarily for Civil Preparedness purposes and are not statewide systems, normally,...Races while performing an admirable role up to now generally is not made up of full time emergency workers...while there is no intent to discourage or disparage RACES and other volunteer help, emergency efforts need to be coordinated with state and local resources to provide maximum utility in disaster situations...requirements for licensed operators (and other reasons) tend to make the amateur service unsuitable as the emergency communications resource for state civil preparedness agencies...Part 99 Disaster Communications Service also lacks desirable features for civil preparedness communications in large states...it is urged the Commission begin rulemaking

proceedings and coordination efforts with other government agencies so this service can be established as rapidly as possible".

Any further suggestions you may wish to make relative to this petition will be welcomed by the Commission, we are certain.



Santo Amato

RAB:bmp

RISL 293 ALLR ALLS ~~NAPL~~
DE RISL 2095 3551900Z
ZNR UUUUU
R 201900Z DEC 76
FM RICHARD BOUCHARD, COMMUNICATIONS AND WARNING OFFICER
TO ALL CD STATES AND DCPA REGIONS
BT

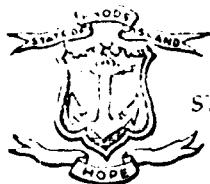
UNCLAS COM 01 FM AMATO DEPUTY DIRECTOR

THE STAFF OF RHODE ISLAND DEFENSE CIVIL PREPAREDNESS AGENCY WISHES TO SHARE WITH OTHER AGENCIES SOME OF ITS REMARKS TO THE ASSOCIATED PUBLIC SAFETY COMMUNICATIONS OFFICERS (APCO) REGARDING THE POTENTIAL ALLOCATION OF FREQUENCIES FOR CIVIL PREPAREDNESS COMMUNICATIONS IN THE PRESENT LOW, HIGH AND ULTRA-HIGH FREQUENCY BANDS.

RHODE ISLAND HAS LONG ADVOCATED THAT A NATIONAL CD FREQUENCY BETWEEN 152-163 MHZ BE ALLOCATED AS A "MEETING PLACE" FREQUENCY FOR FEDERAL, STATE AND LOCAL DCPA'S SUCH AS THE NATIONAL RED CROSS FREQUENCY. SPECIAL RULES WOULD BE REQUIRED SO THAT BASE, MOBILES, AND PORTABLES MAY BE LICENSED, AS WELL AS NON-GOVERNMENT STATIONS.

RHODE ISLAND WAS ESPECIALLY PLEASED TO RESPOND TO THE RECENT APCO INQUIRY ABOUT SUCH FREQUENCIES IN EACH STATE FOR CIVIL PREPAREDNESS MATTERS. THIS WAS BROUGHT ABOUT IN PART BY THE RECENT FCC DECISION TO DISCONTINUE ALLOWING RESTRICTED OPERATORS FROM USING RADIO AMATEUR CIVIL EMERGENCY SERVICE (RACES) RADIOS AND THE INORDINATE AND DIFFICULT TO INTERPRET RULES INHERENT IN THE RACES PROGRAM. RHODE ISLAND BELIEVES THAT A RADIO CIRCUIT SIMILAR TO THE CURRENT INTER-CITY POLICE RADIO CIRCUITS ON 158.97 MHZ WOULD BE A VALUABLE TOOL IN COORDINATING MESSAGES BETWEEN STATE AND LOCAL GOVERNMENTS IN AN EMERGENCY. USUALLY, LAW ENFORCEMENT CIRCUITS ARE CONGESTED DURING EMERGENCIES PRECLUDING USE OF SAME FOR GOVERNMENTAL PROBLEMS. MANY SUBDIVISIONS HAVE SIDELINED EQUIPMENT THAT COULD BE CONVERTED TO SUCH A FREQUENCY. IN THAT, APCO HAS TAKEN THE INITIATIVE TO WORK ON THIS MATTER, RHODE ISLAND URGES ALL STATES TO PROVIDE COMMENTS BEFORE APPROACHING THE FEDERAL COMMUNICATIONS COMMISSION (FCC). PROPOSED ALREADY IS 155.160 MHZ AS A NATIONAL SEARCH AND RESCUE FREQUENCY. YET ANOTHER UN-NAMED FREQUENCY FOR NATIONAL CD WORK, HOPEFULLY IN THE HIGH BAND AND OTHER FREQUENCIES IN EACH STATE FOR INTRA-STATE WORK, APPROVED BY AND UNDER THE LICENSE OF THE STATE CIVIL PREPAREDNESS AGENCY INVOLVED. IN ADDITION, THIS STATE HOPES TO ENCOMPASS IN SUCH A NET, OTHER DISASTER RESPONSE FACILITIES SUCH AS THE PHONE COMPANY, UTILITIES AND OTHER AGENCIES WHO CURRENTLY NET WITH THIS AGENCY VIA RACES. RHODE ISLAND INTENDS TO ESTABLISH STRICT GUIDELINES FOR OPERATION ON THE FREQUENCY PARTICULARLY WITH REFERENCE TO JUST WHERE EACH STATION WOULD BE ESTABLISHED. OUR GOAL IS TO DO AWAY WITH STATIONS OPERATING OUT OF PERSONS' HOMES AND ESTABLISH AN OFFICIAL GOVERNMENTAL "COMMUNICATIONS POINT" IN EACH SUBDIVISION, PROBABLY THE TOWN OR CITY HALL ESPECIALLY WHERE AN EMERGENCY OPERATING CENTER (EOC) DOES NOT EXIST. SHOULD THE RECIPIENT WISH TO COMMENT TO APCO ON THE SUBJECT, WRITE DIRECT TO MR. RHETT MC MILLIAN, EXECUTIVE DIRECTOR, POST OFFICE BOX 669, NEW SMYRNA BEACH, FLORIDA 32069. ANY ASSISTANCE AND INFLUENCE STATES MIGHT BE ABLE TO PROVIDE APCO IN ACCOMPLISHING ITS GOAL OF ACQUIRING SUCH FREQUENCIES FOR CIVIL PREPAREDNESS WOULD BE APPRECIATED.

BT



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

DEFENSE CIVIL PREPAREDNESS AGENCY
State House
Providence, R. I. 02903

November 2, 1977

Mr. Henry Boccella
Iowa Civil Defense Division
Lucas State Office Building
Room B-33
Des Moines, Iowa 50319

Re: Petition to FCC to Establish a Civil Defense Radio Service

Dear Mr. Boccella:

Questions #1 and 2, because civil preparedness agencies integrate multiple service communications in a central facility called an "Emergency Operations Center" (EOC), the most practical communications to FIRST position in a disaster area is communications between that EOC and the disaster scene. The problem that faces CD now is that such CD communications usually takes place on the Radio Amateur Civil Emergency Service (RACES) frequencies. RACES, while serving a useful purpose in coordinating recovery efforts and utilizing the services and equipment offered by amateur radio operators does not compare with public safety communication such as Police and Fire Services which are less restrictive as to operator qualifications and have proven to be extremely dependable.

Response to such disasters by assisting Federal agencies has been hampered due to the fact that communications brought in by the Federal Government did not "net" with communications already functioning at the disaster scene. With the advent of synthesized radios being manufactured, the timing is now most appropriate for Federal agencies to be equipped with radios which could be set on any frequency being used at the disaster scene. Due to the technology and state of the art at this writing, such radios and frequencies best be between 155 and 165 MHz and perhaps another set of frequencies in the 450 MHz region. In addition to published Civil Defense Radio Service frequencies being available to assisting Federal agencies, vital services restoration might also be coordinated over such channels. The capability for the Federal, state and local governments to be able to communicate with one another at disaster scenes just does not exist under the present systems. The Federal government may well lend vital assistance to local governments who may not have the extra equipment necessary to respond to the disaster by bringing in extra radios to augment local systems. These might be held in strategic places and brought in by FDAA or DCPA to "beef up" local communications.

3. The State Police and highway authorities may or may not agree to the need for a CD Radio Service, but that may be because adequate services exist, i.e. Police Radio Service, i.e. Highway Radio Service already exist to satisfy those needs. The requirement for a CD Radio Service is necessary to coordinate local and state governments' response to disasters in a professional manner as is done now with law enforcement in the Police Radio Service and with routine highway maintenance in that service. So-called Inter-City Police Radio Operations in this area on 158.97 MHz already establishes that base to base operation is acceptable to the Commission under unique circumstances in the Land Mobile service--again this is done in the Fire Radio Service, Medical Service on HEAR frequencies and so on. Our proposal is to tie local governments together in the new Civil Defense Radio Service so that local and state governments can communicate with each other day to day and in emergencies. Only day to day use and/or testing can prepare communities properly to use such facilities in emergencies.
4. The ability of the state to communicate with local sub-divisions is rarely a problem during normal times, but in times of emergency, when phone lines are jammed, dial tones are delayed, wires are down, problems become acute. Here in Rhode Island, for example, during the recent Hurricane Belle warning period, the National Weather Service was unable to reach this office using regular telephone service. Cities and towns requiring emergency equipment were also unable to "get through". Amateur radio operators were not available to man the RACES radios in some communities. If a CDRS were established, acting local officials simply could have used that radio to request aid directly of this agency.

5. Planning and Testing

As a minimum, Rhode Island suggests that criteria be established in the new FCC rules that stations to be licensed in such a Service be:

1. A state or sub-division station located in a municipal building or tied into same via control circuits.
2. That there be but one such station in each community with the exception of approvable auxiliary alternate control centers.
3. That there be no home stations.
4. That there be no operator requirements.
5. That selected and approved public utilities, disaster response agencies, CAP, Red Cross, Salvation Army, etc. be authorized to be on the network.

As has been covered before, current FCC rules prohibit base to base operations except in RACES and in the special cases of inter-city police, fire, and HEAR radio systems. It is that flexibility that has proven itself so valuable in the aforementioned services that prompts this petition for inter-government communications in a Civil Defense Radio Service. It is unrealistic to expect that amateur operators or their frequencies could or should be used for the official conduct of Federal, state, and local business and disaster recovery efforts. While amateur assistance is excellent and a credit to the fraternity, it should not be the primary means governments should have to communicate with one another when telephones fail.

Plans and specifications as to whom the actual participants in such a network should be left up to State Civil Preparedness officials. This activity might well be through a simple coordination requirement prior to FCC licenses being issued to the subdivisions. An even less complex method would be to license a single station to the State and allow satellite stations to exist under the control and auspices of one license in each state. This would make the new service less of a problem for the FCC.

6. First, Rhode Island definitely sees the need for at least one high band frequency (152 - 172 MHz) in this service and therefore is in disagreement with the frequency proposal of APCO. It is interesting to note that because the so-called "National Red Cross" frequency is really a disaster relief agency frequency, one such frequency already exists in low band to accomplish a portion of our goals. This agency doubts, however, that Red Cross would appreciate 39 cities and towns in Rhode Island joining them on that frequency.

But it is that concept that will be needed to coordinate such agencies with local governments, but due to the various cities and towns having individual communications problems, frequencies must be selected in each of the popular communications bands to encompass the equipment available and to solve the propagation problems peculiar to each district.

Rarely do other agencies who must give up exclusiveness to share frequencies expound happiness; therefore, we do not expect joy from any agencies who might require relocation or the assignment of replacement channels due to the introduction of a new radio service.

7. The major problem with amateur radio operators and the frequencies allocated to them is that this does not constitute an official means of government communication by the officials involved at the times such communication might be necessary. For example, a tornado with less than 5 minutes notice. By the time amateur radio operators arrive to man RACES radios, the disaster is well underway. Rarely are amateurs employees of the local or state government involved and therefore are more difficult to control. An example of this problem is that there rarely is a problem locating amateur radio operators during daylight or evening hours, but in such situations, the radios must be operated or at least covered 24 hours each day. The reality of it all is that personnel normally assigned to function in behalf of a sub-division on a day-to-day basis with telephones would probably assume the duty as radio operators during the emergency. This would be illegal under the RACES rules but not under the proposed service. Naturally to prepare for such eventualities, the location of such equipment and accessibility to the operators should all be considered and assessed prior to each station joining such a network.

Regarding Citizens Band licensees, the high level of interference and general chaotic conditions that prevail in that band has rendered this service virtually useless to CD. The situation of too many radios existing on but a few frequencies, skip interference, poor operating habits, illegal power and modulation levels, etc. has ruined the potential of this resource for official government communications.

8. Inadequacy of Amateur and Citizens Radio Service Efforts:

It is not to say that the efforts of volunteers in the CB and amateur

services have not been satisfactory--what must be said is that a much better and more highly efficient and professional approach must be taken, if life-saving government response is to occur rapidly enough to matter.

Liken the Civil Defense communications problem to a police department trying to conduct its affairs on the citizens band or amateur radio frequencies. It simply is not in keeping with the degree of professionalism required in government today. Not that local and state governments can't utilize the services of such operators, equipment and frequencies for emergencies, such augmentation is vital in recovery efforts. Recently, in New York City during the blackout, amateur radio operators rode in city police cruisers providing communications when police primary systems failed. Reserving amateurs for just this type of back-up systems is appropriate in today's society.

In summary, the State of Rhode Island has had an excellent relationship with the over 1,000 amateur operators enrolled in our active RACES program. By the same token, it is the active testing of these systems that has brought about this state's desire to improve upon what we have learned through the years. The primary problem with RACES is the requirement for an amateur license to operate; this makes for insurmountable problems at public utilities, the National Weather Service, at state facilities where the public (Amateur operators) may not be welcome for various reasons, etc.

The new service must therefore have absolute minimum operator requirements, i.e. police, fire, personnel.

Restrictions against base to base operation must be eliminated, and base to portable and mobile acceptance during emergencies and tests. Frequencies must be allocated in all the bands for which equipment is manufactured so as to permit use of existing equipment. In many cases, communities lacking funds necessary to purchase might modify an existing base station with an additional channel to accomplish inter-government communication in emergencies or utilize its own surplus equipment. Therefore frequencies should be allocated in the 30 - 50 MHz, 152 - 174 MHz, and 450 MHz bands, as well as the lower frequencies requested by the largest states. Power levels should be limited except for state stations and directional antennas (beams) should be employed in this service as the rule rather than the exception. FCC rules should be flexible enough to allow multi-element antennas to be employed where necessary without a mountain of paperwork. This would require a relaxation of the licensing process, to allow for testing, to determine the best antennas and power necessary to accomplish the task.

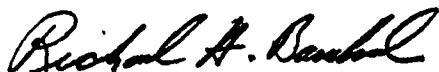
The problem of responding disaster agencies not being able to communicate with one another must also be resolved under this new service. It is no secret that our parent outfit, the Federal Defense Civil Preparedness Agency and this agency cannot communicate with each other in the "field", nor can DCPA and an allied agency, the Federal Disaster Assistance Administration (FDAA) communicate with each other, us, or for that matter, anyone else at any disaster scene!

The proposal of certain "Federal" frequencies being allocated to this new service makes a great deal of sense. There are actually dozens of channels going unused even in the so-called crowded "High Band" of 152 - 174 MHz. Careful study of the users of these channels should be undertaken to determine if sectional allocation might be made in areas of non-use-- petroleum, railroad, government are all examples of limited usage frequencies particularly in this area.

Reference your page 7, RACES; the FCC recently stated in its Report and Order on Docket 19723, "If RACES cannot function without commercial operators, it should probably be removed from the Amateur Service entirely!" From the above statement by the FCC, and the Commission's other comments Re: RACES Via Docket 19723, it would appear the Commission would be open to our petition.

Any additional help this office could provide to assist in getting this petition moving will be provided.

Sincerely,



Richard A. Bouchard
Communications and Warning Officer
Rhode Island Defense Civil Preparedness Agency

RAB:bmp

cc: DCPA National
Attention: Robert Menking

DCPA, Region One
Attention: Allan R. Zenowitz

FDAA, Region One
ATTENTION: Paul Hartzell

Attorney At Law
Joseph M. Kittner, Esq.

STATE OF RHODE ISLAND
DEFENSE CIVIL PREPAREDNESS AGENCY
STATE HOUSE
PROVIDENCE, RHODE ISLAND 02903

May 1, 1979

TO: Local Defense Civil Preparedness Agency Directors, and all
Scheduled Members of the Forthcoming Civil Defense State
Radio Network (CDSTARS)

FROM: State Defense Civil Preparedness Agency Director

SUBJECT: TIME FRAME FOR INSTALLATION AND OPERATION OF CDSTARS

The CDSTARS project is in full swing and our operational prototype station has been functioning in our communications center and is subjected to tests daily.

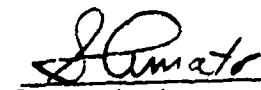
We have had great difficulty in getting delivery of samples and materials necessary to complete the project. This is due in part to strikes, the bidding process, evaluation trials, and long delivery times for various components of the system.

We have decided therefore to speed up the installation of the CDSTARS by doing the following:

1. Install the voice (two-way part of the system) transceivers in the agreed upon locations as soon as our supplier delivers the two-way radio shipment. This will include:
 - a. CDSTARS RF components cabinet.
 - b. CDSTARS power module consisting of a battery-charger and marine type case.
 - c. EMP protection at the serving AC outlet.
 - d. Where needed, cable and antenna, though in most cases the existing State RACES antenna and cable will be used.
 - e. Where agreed upon, extended local control installed.
(Not all stations will have extended local control.)
 - f. A test of the stations ability to communicate with the State EOC.
2. Later, when suppliers provide the necessary materials, the State Technicians will retrofit the previously installed RF components cabinet with:
 - a. Duplexer and associated cables.
 - b. Facsimile VHF receiver.
 - c. Decoder.
3. When the above work is accomplished, a Stewart-Warner datafax machine will be tied into the facsimile VHF receiver through the decoder.

We are finding it increasingly difficult to predict when the system will be fully operational due to the dozen or so vendors all supplying various components of the system, as each has its own delivery problems. At this writing, we can safely

predict that the voice portion of the system (1.) above, will begin being installed during June, as our two-way radio supplier (Standard) has promised delivery for June 4th, 1979.


Santo Amato

RAB:mma

STATE OF RHODE ISLAND
DEFENSE CIVIL PREPAREDNESS AGENCY
STATE HOUSE
PROVIDENCE, RHODE ISLAND 02903

June 12, 1979

TO: Local Directors, CDSTARS Network Members, Radio Officers
FROM: State Director
SUBJECT: CDSTARS INSTALLATIONS, Progress report

The installation phase of the new Statewide Civil Defense State Radio System (CDSTARS) is about to begin. First priority installations will be given to the most difficult points we have located in the system, mainly Woonsocket and Westerly. Second priority will be to political subdivisions having signed loan agreements on file. These communities will be installed on a county basis as practical with concentration on communities having IN PLACE antennas, and coaxial cable. Third priority will be given to political subdivisions requiring antenna installations by the State teams. In all cases, only the two-way radio portion of the CDSTARS will be installed during these initial visits. A second installation visit will be made to install the facsimile receiver, duplexer, facsimile recorder, and where necessary, extended local control. This is due to delayed shipments of materials from the various suppliers to the system. Fourth priority work will be the remainder of the network.

A sketch of a typical desk top installation is enclosed. Certainly a table or shelf arrangement would accomodate the system, if it is durable enough. The desk arrangement is preferred as it allows for storage of supplies such as facsimile copy paper, message forms, pencils etc.

To gain maximum benefit from this communications system, its placement should be very carefully weighed. Security is of paramount importance as there is no possibility of replacement units, also it will be to every points advantage to place these stations at a place where monitoring and observation of the facsimile machine is practical.

A suggestion from the city of Warwick is to have the coaxial cable terminate at two points, such as the central dispatch operators location on a day to day basis, with the alternate coax cable (extension) in the director's office or EOC. In such cases, a second pulse protection, grounding system will be necessary, however.

This office will make every effort to contact Civil Defense Directors and Radio Officers ONE DAY ahead of installation. Please arrange for timely clearances for our State teams, which will be working north and south portions simultaneously.

Thank you for your cooperation.


Santo Amato

RAB:bmp
Enclosure

TYPICKI C.D. STATE RADIO SYSTEM (CDSTARS)

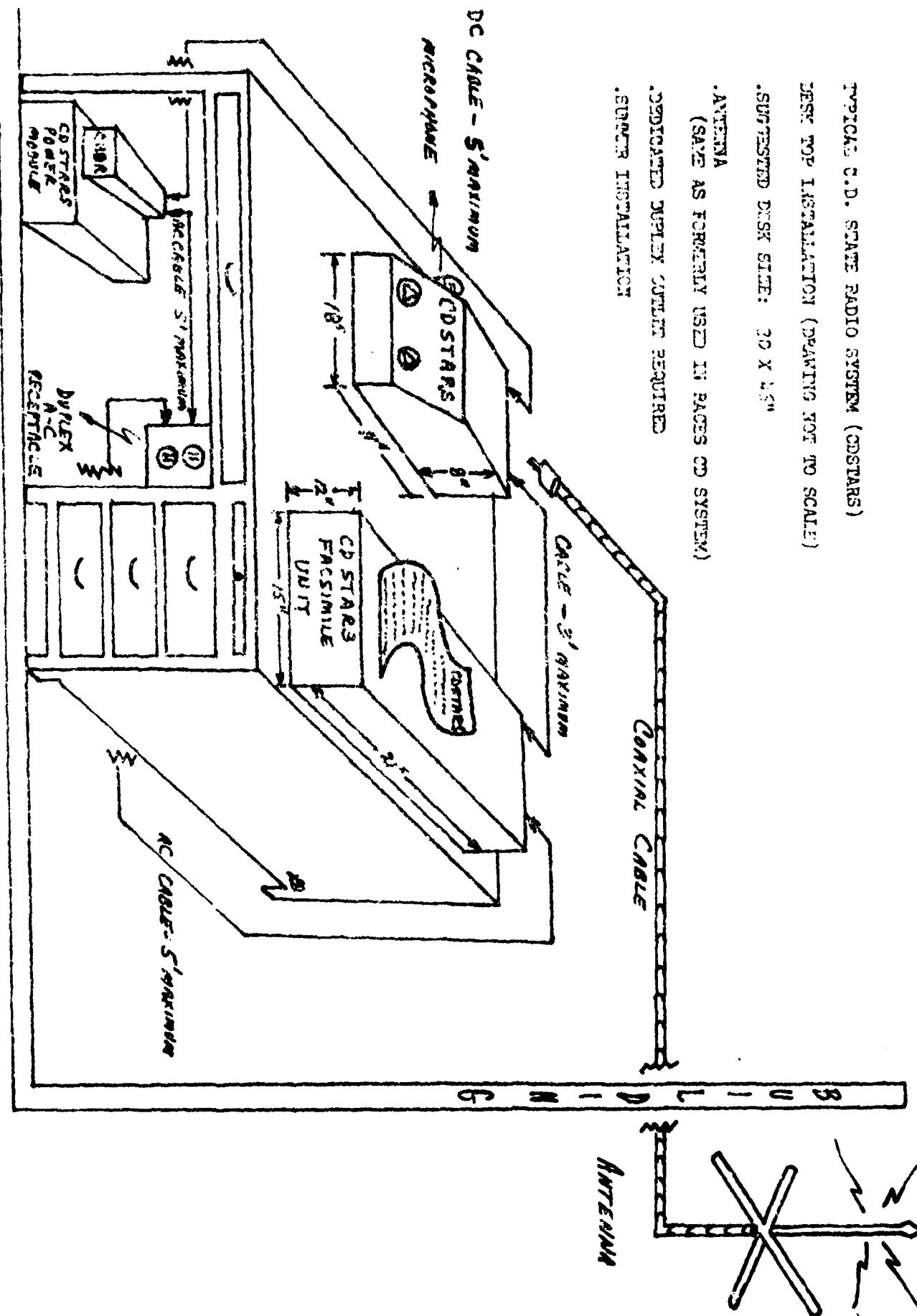
DESK TOP INSTALLATION (DRAWING NOT TO SCALE)

SUGGESTED DASK SIZE: 20 X 45"

(SAVE AS FORTRESS USE IN RACES OR SYSTEMS)

EDUCATED YOUTH JUST REUNITED

الطبقة الأولى



STATE OF RHODE ISLAND
DEFENSE CIVIL PREPAREDNESS AGENCY
STATE HOUSE
PROVIDENCE, RHODE ISLAND 02903

October 20, 1978

TO: Local Directors
FROM: State Director
SUBJECT: THUMBNAIL SKETCH OF "ON-GOING" COMMUNICATIONS PROGRAM
NOW UNDERWAY AT STATE LEVEL

This is to advise all local directors that work is underway at the state level to develop a fully operational two-way FM voice radio system and one way (state to local) record copy system (facsimile) under financing provided by a Federal Grant. (No local funding required!)

This system is being designed to operate on a continuously charged heavy duty battery and to provide radio communications direct to the State EOC, and to adjacent communities and other emergency response points.

The present FCC RACES license, under which civil defense communications has been conducted, expires November 16, 1978 and cannot be renewed. The privilege of using non-amateur operators with restricted operator permits also expires on said date. Due to the reduction in the scope and membership of the network this will cause, this office is announcing discontinuing of evening RACES drills after completion of the November 8 test. The Tuesday morning tests at 8:55 AM will occur simply as tests between radio amateurs, using amateur call signs only, use of tactical call signs will be prohibited after the 16 of November. Such Tuesday morning tests will not be classified as RACES operation, the remaining fragmentary network will be considered "stand-by" until such time as the new Civil Defense State Radio System (CDSTARS) is installed. Once installed, the use of amateur radio frequencies for state to local civil defense communications will be discontinued except for back up. Local RACES operations are encouraged however to continue as an important function!!!

Details of the new system are being worked out at this time. A rough outline of the system, which is not final now, follows:

Each station in the system will comprise of a mobile type, single channel two-way radio with but two controls, volume and

squelch. The unit will be fixed on the special frequency assigned to us for this work, and no operator license will be required. Radio operators will be identified at each subdivision by title and may include amateur radio volunteers when available. Existing antennas will be used where installed and suitable, new antennas installed when necessary. The unit will be installed in the protected area where practical, and remote control provided to an in-building dispatch point if feasible. The record copy machine (facsimile) may be installed at either point and will be portable for relocation in emergencies to the protected area. Exotic installations, hidden wiring, excessive concrete drilling, and other high installation cost items are beyond the scope of this grant... and if required, must be borne locally. The state will provide a working package for each subdivision and emergency response point on loan shortly after written agreement is reached as to specific locations, and other pertinent details on installation. Such agreement shall be signed by the local civil defense director, and will be concurred in by both the local Chief Executive and the State Director.

We are delighted to be in a position to solve our long standing problem of communications and within a short time, this new system will be operational. This office is certain you will be impressed with it and find it very useful for necessary communications during emergencies and when telephone services fails.



Santo Amato

RAB:bmp



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

DEFENSE CIVIL PREPAREDNESS AGENCY

State House
Providence, R. I. 02903

FACT SHEET: New Civil Defense State Radio System

*The state is under federal contract to produce a prototype State-wide Civil Defense Radio Communications System, which is acronymed "CDSTARS".

*The system, which replaces the Radio Amateur Civil Emergency Service (RACES), will be operable by any municipal employee designated to do so, as well as amateur operators.

*The two-way voice system is meant to provide Civil Defense directors and heads of local government with absolute local to state, as well as adjacent community, emergency communications in the event of telephone failure.

*The entire two-way radio transceiver and facsimile system, complete with emergency power supply package, will be provided at no charge to each subdivision, soon after the enclosed loan agreement is approved by the local Civil Defense director and has the concurrence of the local chief executive and the State director.

*The system will require testing once each week of both the voice and facsimile capability.

EXAMPLE: WARWICK TEST - LOUD AND CLEAR - FACSIMILE TEST ACCEPTABLE

=THINGS CIVIL DEFENSE DIRECTORS SHOULD KNOW ABOUT STATE CIVIL DEFENSE COMMUNICATIONS

1. The State Emergency Operating Center switchboard is answered 24 hours a day at 421-7333, only.
2. A Director's HOT LINE telephone number is unlisted and confidential - it should be carried with you.
3. Written teletype messages can always be sent to our EOC by any police department on the State Police Teletype System.
4. Radio communications are never completely confidential. Try the telephone or teletype first.
5. The State Office generally has access to STATEWIDE media; radio, television, newspapers and newsworthy events are solicited.
6. In emergencies, the EBS may be activated --- messages desired on the EBS are to be transmitted to the State EOC.
7. Local announcements, which may not be of interest to the entire state, best be placed through the management of your local EBS station.
8. The new Civil Defense State Radio System (CDSTARS) is planned to function, even if a statewide power failure occurs, being battery powered. This completely independent system is designed to function in emergencies --- especially when telephone service is delayed, or fails.
9. Local Civil Defense communications in Rhode Island consist of volunteer amateur radio operators, manning designated amateur stations, identified in each community's Communications Annex to it's Civil Preparedness Plan.
10. Many communities also mobilize groups or clubs composed of Citizens Band (CB) Radio operators to augment the Radio Amateur Civil Emergency Service (RACES).
11. Though primarily for law enforcement purposes, the inter-city police radio network should not be overlooked when intra-community and intra-state emergency communications becomes necessary.
12. The State EOC contains the most complete communications capability in the State. Among our resources are:
 - A. Direct telephone tie lines to:
 1. Key EBS station WEAN
 2. North American Air Defense Command (NORAD)
 3. All States, all Federal Regional Centers
 4. Department of Transportation
 5. National Weather Service
 6. New England Telephone (Disaster Control)
 7. American Telephone and Telegraph (Radio networks)
 8. State Police, Scituate; Woonsocket Fire Alarm, Newport Police Department and Westerly Police Department
 - B. Two-way radio communications (Existing)
 1. Federal Regional Centers
 2. Rhode Island State Police (All Barracks and Headquarters)

3. Rhode Island Department of Transportation (All units)
4. Rhode Island Department of Environmental Management
5. Rhode Island National Guard
 - a. First Army (Fort Devens)
6. Key EBS Station WEAN
7. Twenty-seven communities on the Rhode Island inter-city police radio network.
8. Five mobile units attached to the State Civil Preparedness Agency.
9. Hundreds of amateur radio operators/volunteers with mobile and portable units through the State/Amateur radio repeater.

C. Telephone capabilities (Existing)

1. An automatic trunk search provides three incoming lines to the public who calls 421-7333, after hours, 421-7334 and 421-7335 are "busied-out" and an answering service monitors the published number.
2. Three additional unpublished telephone lines provide state staff with lines for outgoing calls, one of which is reserved as a "HOT-LINE" for incoming Director's calls during emergencies.
3. Staff Officers also have access to two State Centrex lines, one of which provides tie lines to the four corners of the State and to the Boston area. The other ties staff members to any State Office telephone.
4. A Federal circuit also appears on our switchboard which in turn provides each staff member with the capability of talking with any Federal Civil Preparedness Staff Officer. In addition, the Federal switchboard on this circuit can also provide Federal Telephone Services (FTS) and Autovon connections in emergencies.

D. Television (Existing)

1. Color reception of WJAR-TV(10), WPRI-TV(12) and WSBE-TV(36).
2. Color camera and video tape portable for training and recording disaster footage.
3. Color TV computer/graphics generator for Crisis Relocation Planning(CRP) public information via EBS (television).

E. Radio (Commercial)

1. Reception of about a dozen Rhode Island AM and FM radio stations simultaneously used to monitor monthly station reactions to State conducted tests of the EBS.
2. Continuous monitoring of WXJ-39, National Weather Service Weather Radio, which is maintained by the State Civil Defense Agency.

F. Teletype

1. State Police Teletype System, one of about 50 points on the circuit.
2. Civil Defense National Teletype System (CDNATS), connecting all State Civil Defense Agencies and all Federal Civil Defense Regions.
3. National Weather Service Teletype --- 24 hours a day continuous weather data.

STATE OF RHODE ISLAND
DEFENSE CIVIL PREPAREDNESS AGENCY
STATE HOUSE
PROVIDENCE, RHODE ISLAND 02903

STANDING OPERATING PROCEDURE (SOP) FOR CIVIL DEFENSE STATE RADIO SYSTEM
(CDSTARS)

1. GENERAL

The Civil Defense State Radio System (CDSTARS) is the backup means of communications (telephone being the primary) for inter-governmental and supporting unit communications during emergency situations. CDSTARS, at each location, consists of a two-way radio package, a receive-only facsimile printer and a power module. (The Electric Gas Companies on the system have a two-way radio unit only.)

2. PURPOSE

To provide voice, as well as hard copy communications between local communities and state government as well as other support agencies.

3. OBJECTIVE

To familiarize CDSTARS communications operators with the procedures necessary to promote efficient communications on the circuit. Designed as a training aid, as well as an operational guide, the instructions contained herein outline minimal system requirements, consistent with speed and accuracy. Compatibility must be maintained between all stations on the system.

4. PASSING TRAFFIC OVER THE CDSTARS

The following is a list of recommended procedures to be followed:

- a. Prior to transmitting, listen to the radio to insure that the frequency is not in use, so as not to cut off anyone.
- b. Speak clearly, in a normal voice, holding the microphone close to your lips to minimize operating room noise level, to transmit, depress microphone switch with left thumb, release as soon as you have completed the call. Set volume to a comfortable level - set squelch to a point just past when noise is squelched, between the second and third dots or between "8 and 9 o'clock."

- c. Avoid excessive calling and unofficial transmissions.
- d. Speak clearly so the receiving operator can copy.
- e. Every message will end with either "OVER" or "OUT". Be brief and concise - keep messages short, and in all cases, less than one minute in length, so as not to tie up the network,
- f. Each message will start with the calling station identification. Identification for local communities is their listed town or city name, i.e., Portsmouth, Providence, Cumberland, etc. Identification for state stations is their agency name, i.e., Zambarano Hospital, State Health Department (EMS), etc. Identification for utilities will be the company name, i.e., Valley Gas, Narragansett Electric, etc. The Rhode Island Defense Civil Preparedness Agency (State Civil Defense) is called State Control. This technique of military station identification is called the Positive Voice Identification (PVI)
- g. During normal working hours (Monday thru Friday, 8:30-4:30) and emergencies, the circuit will be monitored and answered by State Control. After normal hours, the circuit is monitored and answered by the Department of Environmental Management's Enforcement Division. All stations should check with State Control before communicating with another station on the CDSTARS network, when practical. At all times good communications practices will be used. Unofficial transmissions and profanity will not be tolerated and corrective actions WILL be taken. Mutual aid requests between communities, calls for emergency power outages to public utilities when telephone lines are busy are encouraged, as well as during any other emergency.

5. RADIO TESTS

Radio tests are held Tuesday morning at 9:00 AM, of each week, except holidays. Prior to the radio role call, a test message will be sent over the facsimile printer. When your station is called, please give the report on facsimile and radio reception. If both are alright your report should be, "NAME OF STATION: RADIO AND FACSIMILE LOUD AND CLEAR". If they are not alright, report the condition as you see it, such as "VOICE LOUD AND CLEAR/FAX UNREADABLE: or "NO FAX" or any other condition that might be present. If for some reason you do not receive anything, at the appointed test time, or you have any other problems concerning CDSTARS, you should call this office at 421-7333 and report the trouble. This office owns and services all stations in the network except Public Utilities.

6. SECURITY

No public access to any CDSTARS station is permitted. Steps should be taken to prevent unauthorized persons from using the transmitter, especially after normal hours. In some cases, a locking desk may serve to protect the radio from theft and unauthorized operation after the close of business. In locations that are always manned, the security problem is lessened.

7. AUTHORITY

This system operates on military frequencies for tactical training, disaster and mutual aid service under a cooperative agreement between the Rhode Island Defense Civil Preparedness Agency and the Rhode Island National Guard. No additional stations or equipment, except that issued by the RIDCPA, is authorized. The net control call sign is AAB500 - all other stations will use Positive Voice Identification (PVI). The radio frequency authorization for this network (which expires 30 April 1985) is on file at both the office of the Adjutant General, Rhode Island National Guard and office of the Director, Defense Civil Preparedness Agency, State House, Providence, Rhode Island 02903.

CONFERENCE FOR PUBLIC OFFICIALS

Funded by a Grant from the Federal Emergency Management Agency (FEMA).

Communications and Warning: Richard A. Bouchard
Communications and Warning Officer
Governor's Emergency Broadcast System (EBS)
Coordinator

Below is a thumbnail sketch of the existing, in place, disaster management systems, which are available to you to assist in communicating with adjacent and state governments when emergency situations develop in your community which are beyond the scope of local resources.

TELEPHONE: Civil preparedness communications is based upon the use of ordinary telephones for optimum privacy and convenience. Local directors are provided with a hot line to the state office. When telephone service is disrupted, local governments must have an alternative system for expedient communications. To this end, the State of Rhode Island, under a Grant from the Federal Emergency Management Agency (FEMA) has provided on loan to each community, a complete battery operated two-way radio system, which provides absolute radio communications, not only with the State Capitol, but also with adjoining communities, for mutual aid. This system is called the "CIVIL DEFENSE STATE RADIO SYSTEM" (CDSTARS). The location of each CDSTARS radio has been a matter of mutual agreement between the local Civil Preparedness Director, the State Director and head of local government. The exact location varies from community to community but in each case, was selected with great care, to be a place where decisions are made during emergencies. CDSTARS also has a facsimile receive capability which permits reception of messages originated from State "CD" Headquarters. During large scale emergencies, these messages may have dramatic impact on communities and should be monitored, logged, copied and distributed to those in charge. It is hoped that public officials will look into the operation of CDSTARS in each of their communities to be certain it is available to them in emergencies.

RILETS: The Rhode Island Law Enforcement Telecommunications System. Should a community wish to transmit a written message to the State Capitol, to the Governor or to the State "CD" Headquarters, your local police department can generate a message on the system directed to the State Capitol by placing the Call Directing Code (CDC): RICD0000 at the beginning of the message. To be certain local departments know this procedure, tests of the system are conducted at regular intervals by our agency. These tests of the RILETS as the State Warning System (SWS) serve to provide a method of alerting local communities of events which may effect the lives and property of local residents. These warning messages may originate from the State Warning Point; Rhode Island State Police Headquarters, Scituate; the Alternate State Warning Point; Rhode Island Defense Civil Preparedness Agency Headquarters, State House or from the National Weather Service Office in Warwick. In each case, the warnings may suggest that local warning be issued to the population.

LOCAL WARNING SYSTEMS: In order to get the public's attention, methods must be developed to alert the public to extraordinary danger. The State provides the State Warning System (RILETS) to communities who qualify (24 hour coverage) but local warning systems are a local responsibility. Generally, sirens are used to alert the public to danger. Lately, the high cost of purchasing and maintaining sirens have caused many communities to let their local warning systems deteriorate. The shortage of federal matching funds to finance these systems has not helped a bad situation get any better! As a result, most communities have turned to alternative local warning systems, such as mobile warning provided by law enforcement and fire vehicles with public address systems. Realising the decline in local warning system penetration, the state has stepped up its activity with reference to the Emergency Broadcast System. Though not as thorough as sirens, after normal viewing and listening hours, the EBS is a most effective means of reaching the public quickly and efficiently.

The Federal Communications Commission (FCC) permits this agency to test the statewide effectiveness of the EBS as a public information and warning system and these tests involve all Rhode Island broadcast outlets, there are thirty in all. To simplify the system, it is suggested that communities with messages for the EBS use the CDSTARS or RILETS systems to transmit those messages to the communications center to be forwarded to the public via the EBS. This assumes the State FCC to be manned. In the event of a local problem such as toxic gas releases requiring local evacuation, the Rhode Island State Police could be notified and they in turn could activate the EBS with the message. The National Weather Service can also be used to assist in gaining EBS activation. Both National Weather Service and State Police are on CDSTARS and RILETS. An effective local arrangement with your serving local station is also practical. Such arrangements, while not statewide in scope, are adequate for many emergency situations. Management of these local stations will be happy to discuss these arrangements with local Civil Defense Directors and public officials. The logistics for how to verify authenticity of messages and other details are local procedures to be worked out as needed. It should be noted that the State EBS also serves as an attack warning medium, and of course, nearly everyone has seen its use as a public information medium during the Great Blizzard of '78. The State, in cooperation with the FCC, FEMA and the State's television stations, is embarking on a new experimental concept of live video program origination from the State EOC using amateur television as the link. This video will be supported with the written word (graphics) for the hearing impaired. You'll be seeing tests of this program soon in conjunction with the normal radio tests this office conducts. Your comments in writing would be appreciated.

A reminder that the State "CD" Headquarters have portable videotape capability and that any situation which becomes such a large emergency that it fits the "Disaster" category should be brought to our attention to document the event, even if no other state help is required. Such footage of large scale evacuations, local personnel in action or equipment usage, help others solve problems by observation of these tapes. Please call us so that we may record the events as they happen for "History".

While the State "CD" telecommunications unit maintains the entire statewide CDSTARS and all other telecommunications systems in the State EOC, that is the limit of our maintenance assistance. The State does offer technical consulting services on communications matters to all communities who have approved Program Papers.

THE FOLLOWING A CHECKLIST OF ITEMS YOU SHOULD BE AWARE OF IN YOUR COMMUNITY RELATED TO COMMUNICATIONS AND WARNING:

DEFINITION OF THE CDSTARS UNIT IN YOUR COMMUNITY _____

DEFINITION OF THE RILETS UNIT IN YOUR COMMUNITY (POLICE HDQTRS.) _____

(Have you become acquainted with the procedure for transmitting messages on the circuit? You are welcome to send us a message during any business day.)

DEFINITION OF THE WARNING DEVICES (SIRENS) SERVING AS YOUR COMMUNITIES EMERGENCY ALARMS _____

ARE PROCEDURES IN PLACE TO PERMIT QUICK ACTIVATION OF YOUR LOCAL WARNING SIRENS? _____

DO YOU HAVE A DELAY? _____ MOBILE WARNING PROCEDURES? _____

DO YOU HAVE SYSTEMS TESTED? _____ WEEKLY? _____ MONTHLY? _____

DO YOU HAVE A LOCAL EMERGENCY OPERATING CENTER? _____

IS THE CDSTARS LOCATED THEREIN? _____

DO OTHER COMMUNICATIONS ARE AVAILABLE TO YOU AT THE LOCAL EOC? _____

DO YOU HAVE PUBLIC WORKS AMATEUR RACES CDSTARS SENDER NETWORK

AND LOCAL COMMUNICATIONS ARE THERE ENOUGH FOR AN EMERGENCY DO YOU HAVE

PLANS FOR RELOCATION OF PHONES DO YOU HAVE A GOOD LOG KEEPING PROCEDURE TO CUT OUT MESSAGES? _____

DO YOUR COMMUNICATIONS OFFICER MAINTAIN A ROSTER OF COMMUNICATIONS PERSONNEL WHICH CAN BE CALLED UPON IN AN EMERGENCY TO MAN THE CDSTARS AND OTHER COMMUNICATIONS EQUIPMENT? _____

DO YOU CONTINUOUSLY MONITOR NOAA WEATHER RADIO WMR-89? _____

DO YOU HAVE TONE DECODING FOR WEATHER WARNINGS? _____

DO YOUR EOC CONTAIN SOME OF THE FOLLOWING EQUIPMENT WHICH WOULD BE USEFUL IN SHARING INFORMATION IN EMERGENCIES?

DO YOU HAVE AN EMERGENCY GENERATOR WHICH IS TESTED REGULARLY? _____

DO YOU HAVE A COPIER MACHINE OR A MICROFILM MACHINE TO DISTRIBUTE IN MULTIPLE COPIES? ETC. SERIALIZED BY THIS SITUATION, IE: VALID PHONE NUMBERS, CORRECT ANSWERS TO QUESTIONS WHICH MIGHT NOT BE ANSWERED BY VOLUNTEER PERSONNEL AND WORKERS, ETC. _____

DO YOU HAVE A PUBLIC ADDRESS SYSTEM TO RECALL WORKERS WHO MAY HAVE LEFT THE AREA? _____

Our Public Address System reaches into all areas of our EOC and is invaluable in locating "lost" staff personnel) YOUR PA SYSTEM SHOULD COVER THE ENTIRE BUILDING IN WHICH YOUR EOC IS A PART OF. PORTABLE "BULL HORNS" ARE USEFUL TOO.

ERASABLE STATUS BOARDS AND MAPS ARE USEFUL IN SHARING INFORMATION IN EMERGENCY OPERATING CENTERS SHOULD DUPLICATING BE TOO TIME CONSUMING OR IMPRACTICAL. DO YOU HAVE MAPS AND BLACKBOARDS AVAILABLE IN YOUR EOC? _____

ARE YOU TIED INTO ANY LOCAL COMMUNICATIONS SUPPORT ORGANIZATIONS SUCH AS CB OR AMATEUR? _____ IF SO, HOW WOULD YOU CHANNEL A REQUEST FOR ASSISTANCE INTO THAT GROUP? _____

The State is involved with an amateur radio repeater which permits state-wide communications from amateur mobile and portable units. Several hundred amateurs have expressed their willingness to help in emergencies using this repeater. Channel requests for assistance to State "CD".

TOURS OF THE STATE EMERGENCY OPERATING CENTER (EOC): Local "CD" staff members are invited to tour the State EOC when in Providence. Advance notice of twenty-four hours would be appreciated so the tour will be accompanied by demonstrations of some of our newer technical facilities. Call 421-7333 for an appointment or notify us of your impending visit over RILETS with a written message.

FEDERAL COMMUNICATIONS COMMISSION

WASHINGTON, D.C. 20554

MAR 1980

IN REPLY REFER TO

2530

Mr. Richard A. Bouchard
8 Priscilla Road
Woonsocket, Rhode Island 02895

Dear Mr. Bouchard:

I have reviewed your request concerning possible Amateur Radio Service interface (rebroadcast) between your station (W1HQV) and WJAR-TV, WPRO-TV, WSBE-TV and possibly ~~WBZ~~-TV, WLNE.

Procedure for obtaining rebroadcast authority under such circumstances is as follows. The Amateur Radio Service licensee wishing to authorize rebroadcast of his transmissions must give written permission to the broadcast stations in advance. The broadcast stations may then request by letter or telephone that the Commission waive its Rules, Section 73.1207, concerning rebroadcast. Within one week of a telephone request, the broadcast station must submit the request in writing to the Commission. Any written request must include a copy of the document granting the broadcast station rebroadcast authorization.

In your letter, you stated correctly that station identification of an Amateur Radio Service station is required once every ten minutes, as shown in Part 97.84(a). One way to comply with the Rules concerning station identification is to transmit video and/or audio identification of your station's callsign during the linkup of the Emergency Operations Center (EOC) and the broadcast station. No reference to the rebroadcast may be made by the Amateur Radio Service station, in order to comply with Part 97.113 of the Rules.

It should be noted by individuals planning for EBS interface or rebroadcast, that the Amateur Radio Service 420-450 Mhz. allocation is not part of the Radio Amateur Civil Emergency Service (RACES) allocation at the present time. Because of this fact and because 420-450 Mhz. is shared with certain U.S. Government Agencies on a non-interference basis, it is entirely possible that it would be removed from Amateur Radio Service usage should the President invoke Section 606 of the Communications Act of 1934.

If I can be of further assistance, please do not hesitate to contact me.

Sincerely,

Raymond W. Seddon
Raymond W. Seddon
Chief, Emergency Communications Division

A-14-17

